

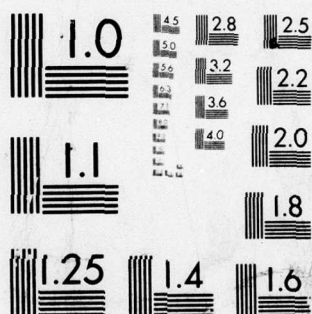
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PROPELLANT SURVEILLANCE REPORT LGM-30 F AND G STAGE 1. PHASE E.--ETC(U)  
MAY 77 J A THOMPSON

OGDEN AIR LOGISTICS CENTER HILL AFB UTAH PROPELLANT L--ETC F/G 21/9.2  
PROPELLANT SURVEILLANCE REPORT LGM-30 F AND G STAGE 1. PHASE E.--ETC(U)  
MAY 77 J A THOMPSON  
MANCP-370(77) NL

**MANCP-370(77)**

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HILL AIR FORCE BASE, UTAH 84406

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PROPELLANT  
SURVEILLANCE REPORT  
LGM-30 F&G STAGE 1  
PHASE E, SERIES III  
TP-H1011

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PROPELLANT LABORATORY SECTION

MANCP REPORT

370(77)

MAY 1977

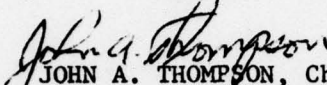
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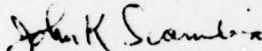
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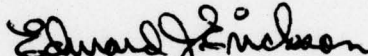
PROPELLANT SURVEILLANCE REPORT  
LGM-30 F & G STAGE I (TP-H1011)

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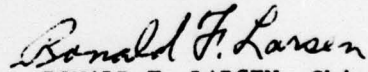
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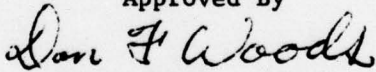
  
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May 1977

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# ABSTRACT

This report contains propellant test results from cartons of TP-H1011 bulk propellant representing LGM-30 F and G First Stage Minuteman Motors. This report uses a statistical approach to analyze the bulk carton propellant data. Testing was accomplished in accordance with MMWRM Project M72632-5MP116P.

The data from this test period are combined with data from previous testing and entered into the G085 computer for storage, analysis and regression analysis. From the statistical analysis of all data tested to date (twelve years for F and G), significant degradation of the propellant does not appear likely for at least two years past the oldest data point.

Each point on the regression plot represents the mean of all samples at that particular age. The number of samples at each point is indicated on the sample size summary sheet on the page accompanying each regression plot or group of regression plots. The data range at any age can be found by suitable inquiry of the G085 system.

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29B	Zero Time Test Results	29 Jan 64
29C	Zero Time Test Results (Supplement 1)	30 Mar 64
29D	Zero Time Test Results (Aft Closure)	9 Jun 64
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118	ATP Phase II, wings II-V (First Group)	5 Mar 68

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130	ATP Phase II, Wings II-V (Third Group)	3 May 68
162	ATP Phase I, Wing VI (Second Group)	30 Sep 69
176	ATP Phase II, Wing VI (First Group)	15 Apr 70
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288	Propellant Surveillance Report LGM-30 A & B, Stage I, TP-H1043	Mar 74
290	Propellant Surveillance Report LGM-30 F & G, Stage I, Phase B, Series I TP-H1011	Mar 74
300	Minuteman Stage I Motor Reliability Improvement Program Surveillance	May 74

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<u>Report Nr</u>	<u>Title</u>	<u>Report Date</u>
302	Propellant Surveillance Report LGM-30 A & B Stage 1, TP-H1011	Nov 74
313	Stage 1 Propellant Surveillance Report, Propellant Containing Glacial Acrylic Acid	Oct 74
315	Propellant Surveillance Report LGM-30 F & G Stage 1, TP-H1011	Jan 75
316	Propellant Surveillance Report LGM-30 A & B Stage 1, TP-H1011	Feb 75
319	Propellant Surveillance Report LGM-30 Dissected Motors, Phase VI, TP-H1011	Apr 75
321	Propellant Surveillance Report LGM-30 F & G Stage 1, Phase B, Series II, TP-H1011	Apr 75
325	Propellant Surveillance Report LGM-30 A & B Stage 1, TP-H1011	Jun 75
328	Propellant Surveillance Report LGM-30 A & B Stage 1, TP-H1011	Sep 75
330	Propellant Surveillance Report LGM-30 F & G Stage 1, TP-H1011	Oct 75
335	Stage 1 Motor Reliability Improvement Program	Dec 75
337	Propellant Surveillance Report LGM-30 A & B, Stage 1, TP-H1043	Feb 76
339	Stage 1, New MAPO & ERL-510 Qualification	Mar 76
341	Propellant Surveillance Report LGM-30 Dissected Motors, Phase VII, TP-H1011	Mar 76

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343	Propellant Surveillance Report LGM-30 A & B, Stage 1, TP-H1011	Jun 76
345	Propellant Surveillance Report LGM-30 F & G, Stage 1 Phase B, Series III, TP-H1011	Jun 76
350	Qualification of a New MAPO Source and ERL-510 Curing Agent for Minuteman, Stage 1, UF-2121 Liner	Sep 76
351	Propellant Surveillance Report LGM-30 A & B, Stage 1, TP-H1011	Sep 76
354	Minuteman Stage 1 Motor Reliability Improvement Program Surveillance	Sep 76
358	Propellant Surveillance Report LGM-30 Dissected Motors, Phase VIII, TP-H1011	Oct 76
360	Propellant Surveillance Report LGM-30 F & G, Stage 1 Phase E, Series III, TP-H1011	Nov 76
367	Propellant Surveillance Report LGM-30 A & B, Stage 1, TP-H1011	Apr 77

## GLOSSARY OF TERMS AND ABBREVIATIONS

Aging Trend	A change in properties or performance resulting from aging of material or component
CSA	Cross Sectional Area
DB	Dogbone
Degradation	Gradual deterioration of properties or performance
E	Modulus (psi), defined as stress divided by strain along the initial linear portion of the curve.
EB	End Bonded
EGL	Effective Gage Length
em	Strain at maximum stress
er	Strain at rupture
"F" ratio	The ratio of the variance accounted for by the regression function to the random unexplained variance. The regression function having the most significant "F" ratio is used for plotting data. The ratio is also used in detecting significant changes in random variation between succeeding time points
JANNAF	Joint Army, Navy, NASA, Air Force
MANCP	Propellant Lab Section at Ogden Air Logistics Center
Ogden ALC	Ogden Air Logistics Center, Air Force Logistics Command
r or R	The Correlation Coefficient is a measure of the degree of closeness of the linear relationship between two variables
Regression Equation	The general form of the regression equation is $Y = a + bx$
Regression Line	Line representing mean test values with respect to time
$S_b$	Standard error of estimate of the regression coefficient

# GLOSSARY OF TERMS AND ABBREVIATIONS (cont)

$S_e$ or $S_{Y.X}$	Standard deviation of the data about the regression line
$S_m$	Maximum Stress
$S_r$	Stress at rupture
Standard Deviation ( $S_y$ )	Square root of variance
Strain Rate	Crosshead speed divided by the EGL
"t" test	A statistical test used to detect significant differences between a measured parameter and an expected value of the parameter (determines if regression slope differs from zero at the 95% confidence level)
Variance	The sum of squares of deviations of the test results from the mean of the series after division by one less than the total number of test results
3 Sigma Band	The area between the upper and lower 3 sigma limit. It can be expected that 99.73% of the inventory represented by the test samples would fall within this range assuming that the population is normally distributed.
90-90 Band	It can be stated with 90% confidence that 90% of the inventory represented by the test samples would fall within this range assuming that the population is normally distributed

## INTRODUCTION

### A. PURPOSE:

Laboratory testing has been performed for twelve years on First Stage LGM-30 F and G Minuteman Motor propellant blocks to evaluate the effects of aging on TP-H1011 propellant. This report contains those tests conducted on propellant as instructed in MMEMP Test Directive GTD-1C, Amendment 2, LGM-30 First Stage Operational Propellant Laboratory Testing.

Statistical analysis of the data from tests performed will provide early warning if serious degradation trends develop. Annual evaluation of the propellant provides data for input into engineering reliability analysis for service life predictions.

### B. BACKGROUND:

LGM-30 F and G testing was started in 1966 with phase testing at 24 month intervals (Report Numbers 78 - zero time; 104, 162, 185-Phase I, 176, 239, 257-Phase I, 271-Phase III). Report Number 257 was the first time that LGM-30 F and G data were statistically analyzed separately from LGM-30A and B data. The present report is a continuation of testing and statistical analysis.

Zero time testing for LGM-30A, B, F and G was started as soon as possible after receipt of the propellant by MANCP. Data from these tests were used to establish a base line for each test parameter.

The LGM-30F and G propellant test matrix (Table 1) is used to determine the number of specimens to be taken from each propellant loaf and the specific test or tests to which these specimens are to be subjected. Very low rate and low rate tensile specimens are taken on all LGM-30F and G blocks. Specimens for other physical and combustion tests are taken from every third (LGM-30F and G) block.

TABLE 1

## SAMPLE PLAN

The Procedure for determining tests to be performed on propellant batch samples of LGM-30 F & G First Stage Motors are as follows:

1. Divide the USAF motor serial numbers into three groups by dividing the last three digits of each serial number by three to determine the remainder integer, e.g.,  $154 \div 3 = 51$  with a remainder integer of 1.
2. Use the remainder integer to enter the following matrix to determine the group of tests to be performed on the forward, middle, and aft batch samples associated with a particular motor serial number.

TP-H1011 PROPELLANT BATCH SAMPLE	GROUP MATRIX		
	GROUP I	GROUP II	GROUP III
Forward	1	2	0
Middle	0	1	2
Aft	2	0	1

Each group will receive the following tests:

TEST MATRIX		
GROUP I	GROUP II	GROUP III
High Rate Triaxial	Dynamic Response	High Rate Hydrostatic
Creep	Stress Relaxation	Sol Gel
Biaxial Low Rate	Burning Rate	DSC
TCLC	Heat of Explosion	TGA
Hardness	Pressure Time	DTA
Ignitability		Impact

NOTE: Low Rate and Very Low Rate Tensile tests are performed on all blocks.

## STATISTICAL APPROACH

In order to determine aging trends for shelf/service life predictions, as directed by Service Engineering, First Stage LGM-30 F and G Minuteman TP-H1011 propellant blocks have been under-going testing since 1966, statistically analyzed and reported on a regular test cycle by this laboratory.

The primary reason for performing statistical analysis on test data is for the detection of propellant changes due to aging that would affect motor reliability. The method of analysis called regression was used to examine data and to draw meaningful conclusions about dependency relationships that may exist i.e., relationship between age versus test results.

In selecting the best fit model for the regression equation, six models were fitted to the data (see regression models at the end of this statistical approach). The linear model  $Y = a + bX$  was found to be the best fit model for 96% of the regression plots. The model used is shown in the regression equation at the top of every regression plot and those which are not linear will also be listed and discussed in the test results section.

Individual data points from different time periods were used to establish a least squares trend line for the data. The variance about the regression line, obtained using individual values of the dependent variable, was used to compute a tolerance interval such that at the 90% confidence level 90% of the sample distribution falls within this interval. This tolerance interval was extrapolated to a maximum of 24 months into the future from age of the oldest motor tested. The 't' values and the

significance of this statistic, which are reported for each regression model, give an indication of the "statistical significance" of the slope of the trend line as compared to a line of zero slope. Data were plotted by computer. The 'y' axis is computed so that the values at one inch intervals are peculiar to the data spread of the parameter tested. Plotted data points represent means at the particular ages at which testing occurred. The number of specimens at each age point is indicated on the sample size summary sheet accompanying the regression plot. Variance at each test age can be determined by consulting the G085 data storage system.

A comparison of the slopes of the regression trend lines and their Y - axis intercepts found in the regression equation was performed. Of the tests common to this test period and the last test performed (MANCP Report Nr 360 (76)), the following observations were made: 23.68% of the aging trend lines have become flatter or closer to a line of zero slope which indicates less change due to age; 63.16% of the aging trend lines show more change although the changes are gradual and no operational problems are expected at this time; and 13.16% of the aging trend lines show no change from the last test period.

A post cure effect (propellant stabilizing after the first year or two) has been observed on some of the early test data (stress relaxation at -65°F, -40°F, and 20°F; TGA percent weight loss at 250°C; DTA exotherm 1, and exotherm 2); which tended to bias and skew the projected trend lines. To overcome this factor, two methods of analysis were performed: First, where possible, non-linear models were used that would best fit the total data (TGA % weight loss at 250°C, DTA exotherm 1 and exotherm 2 data); second, where non-

linear models did not fit the data, this early data was eliminated (Stress Relaxation at -60°F, -40°F, and 20°F data). By compensating for this post cure biasing a more accurate aging trend line for service life prediction is provided.

#### REGRESSION MODELS

Reciprocal of X

$$Y = a + b (1/X)$$

Natural log of X

$$Y = a + b (\text{LN } X)$$

LOG to the base 10 of X

$$Y = a + b (\text{LOG } X)$$

Square Root of X

$$Y = a + b \sqrt[2]{X}$$

Cube Root of X

$$Y = a + b \sqrt[3]{X}$$

Linear equation

$$Y = a + bX$$

## TEST RESULTS

### VERY LOW RATE TENSILE (0.002 in/in/min):

The very low rate tensile data shows a statistically significant decrease for strains and an increase for stresses and modulus. The trends are gradual for the respective regressions and no problems are indicated for at least two years after the last test date (Figures 1 thru 5).

### LOW RATE BIAXIAL TENSILE:

A statistically significant gradual decrease is shown for strains and a statistically significant gradual increase is shown for stresses and modulus (Figures 6 thru 10).

### LOW RATE TENSILE:

Low rate tensile data shows a statistically significant gradual decrease for strains and a statistically significant increase for stresses and modulus (Figures 11 thru 15).

### HIGH RATE TRIAXIAL TENSILE:

The strains, stresses and modulus show a statistically significant gradual decrease (Figures 16 thru 20).

### HIGH RATE HYDROSTATIC TENSILE:

The strains show a statistically significant gradual decrease with the stresses and modulus showing a statistically significant gradual increase (Figures 21 thru 25).

#### TENSILE SUMMARY:

The test data shows that the strain is gradually decreasing and stress and modulus is gradually increasing, except for the high rate triaxial test data which shows a gradual decrease for stress and modulus.

Therefore, based on the analysis of the data from the tensile test parameters, it does not appear that meaningful degradation is occurring at this time and no operational problems are expected for at least two years beyond the last data point.

#### STRESS RELAXATION MODULUS:

For the 0.5% strains at  $-65^{\circ}\text{F}$ , a statistically significant gradual increase is shown (figures 26 thru 29). There is no significant trend for the 0.5% strain at  $-40^{\circ}\text{F}$  except for the 1000 second regression which shows a statistically significant gradual decrease (Figures 30 thru 33).

For the 3% strain at  $20^{\circ}\text{F}$ ,  $77^{\circ}\text{F}$ ,  $100^{\circ}\text{F}$ ,  $140^{\circ}\text{F}$  and  $180^{\circ}\text{F}$ , a statistically significant gradual increase is shown except for  $20^{\circ}\text{F}$  at 10, 50 and 100 seconds which is not changing significantly (Figures 34 thru 53).

#### SOL GEL:

The percent extractables do not show a statistically significant change. A statistically significant increase is shown for the gel swell ratio, sol gel density and crosslink density (Figures 54 thru 57).

#### TEAR ENERGY:

No significant change is shown in the regression (Figure 58).

#### HARDNESS:

Shore A ten second hardness data shows a statistically significant gradual increase (Figure 59).

#### SUMMARY OF TENSILE, HARDNESS & SOL GEL TESTING:

The tensile, hardness, stress relaxation and sol gel testing data correlate well. The regressions show a gradual decrease in strains and a gradual increase in stresses, hardness and crosslink density. The statistically significant changes are gradual and no operational problems are expected for at least two years beyond the last test data date.

#### BURNING RATE:

The burning rate shows a statistically significant gradual decrease. (Figure 60).

#### PRESSURE TIME:

Maximum pressure shows a statistically significant gradual decrease and the time to maximum pressure is not changing significantly (Figures 61 and 62).

#### IGNITABILITY:

Ignitability shows a statistically significant gradual increase in the time required for ignition (Figure 63).

#### TCLE:

The thermal coefficient of linear expansion for both below and

above the glass transition point ( $T_g$ ) shows a statistically significant gradual increase (Figures 64 and 65).

TGA:

A statistically significant increase is shown for the ignition temperature ( $9^{\circ}\text{C}$  rise/min) and the percent weight loss at  $250^{\circ}\text{C}$  hold ( $12^{\circ}\text{C}$  rise/min to hold) with the weight loss at ignition ( $9^{\circ}\text{C}$  rise/min) showing no significant change (Figures 66 thru 68). For percent weight loss at  $250^{\circ}\text{C}$  hold, Model  $\frac{1}{X}$  was found to better represent the data than the linear model.

DTA:

The endotherm, first exotherm and second exotherm show a statistically significant decrease. For exotherm 1 and 2, the Model  $\log X$  was found to be a better representative of the data than the linear model. The third exotherm and ignition temperatures show a statistically significant increase (Figures 69 thru 73).

DSC:

A statistically significant decrease is seen in all regressions (Figures 74 thru 76).

## CONCLUSIONS

Twelve years of aging at ambient temperature (77°F) has not greatly changed the properties of the propellant. Some test parameters indicate slight aging trends, but nothing that would adversely affect the operational characteristics of the rocket motor propellant.

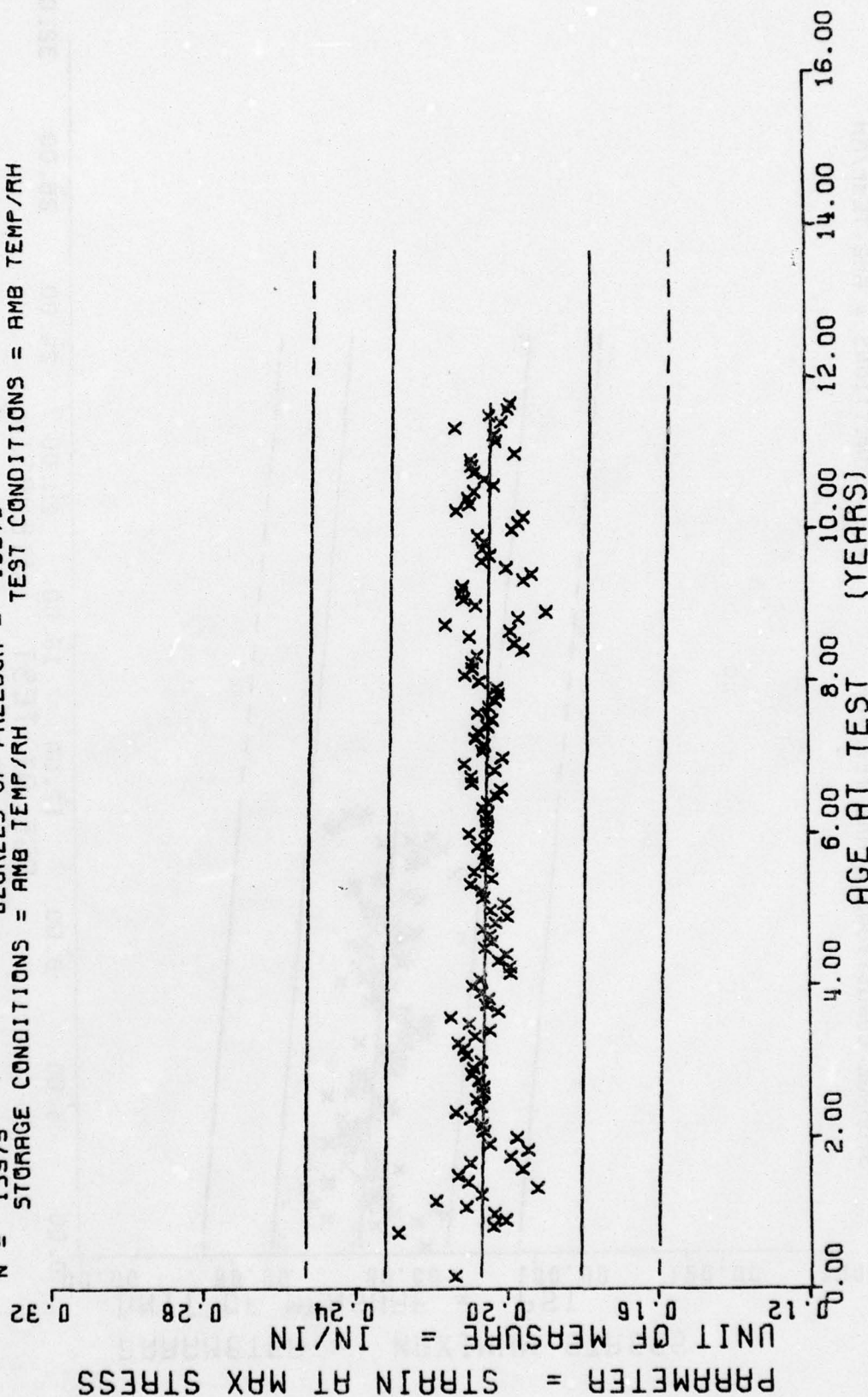
From the statistical analysis, it does not appear that significant propellant degradation is occurring. Based on the twelve years of accumulated data, there is no reason to suspect that properties will show much change for at least two years past the last data point. Therefore, propellant reliability should not change appreciably over that time period. Since failure limits are not available for the parameters tested, this statement is based on the fact that the slope of the regression curves where statistically significant are, with few exceptions, relatively flat or close to a line of zero slope and have not changed appreciably from the last test period.

[illegible]

WING 6,V.L.R.TENSILE,STRAIN AT MAX STRESS,CHS=0.002 IN/MIN TP-H1011

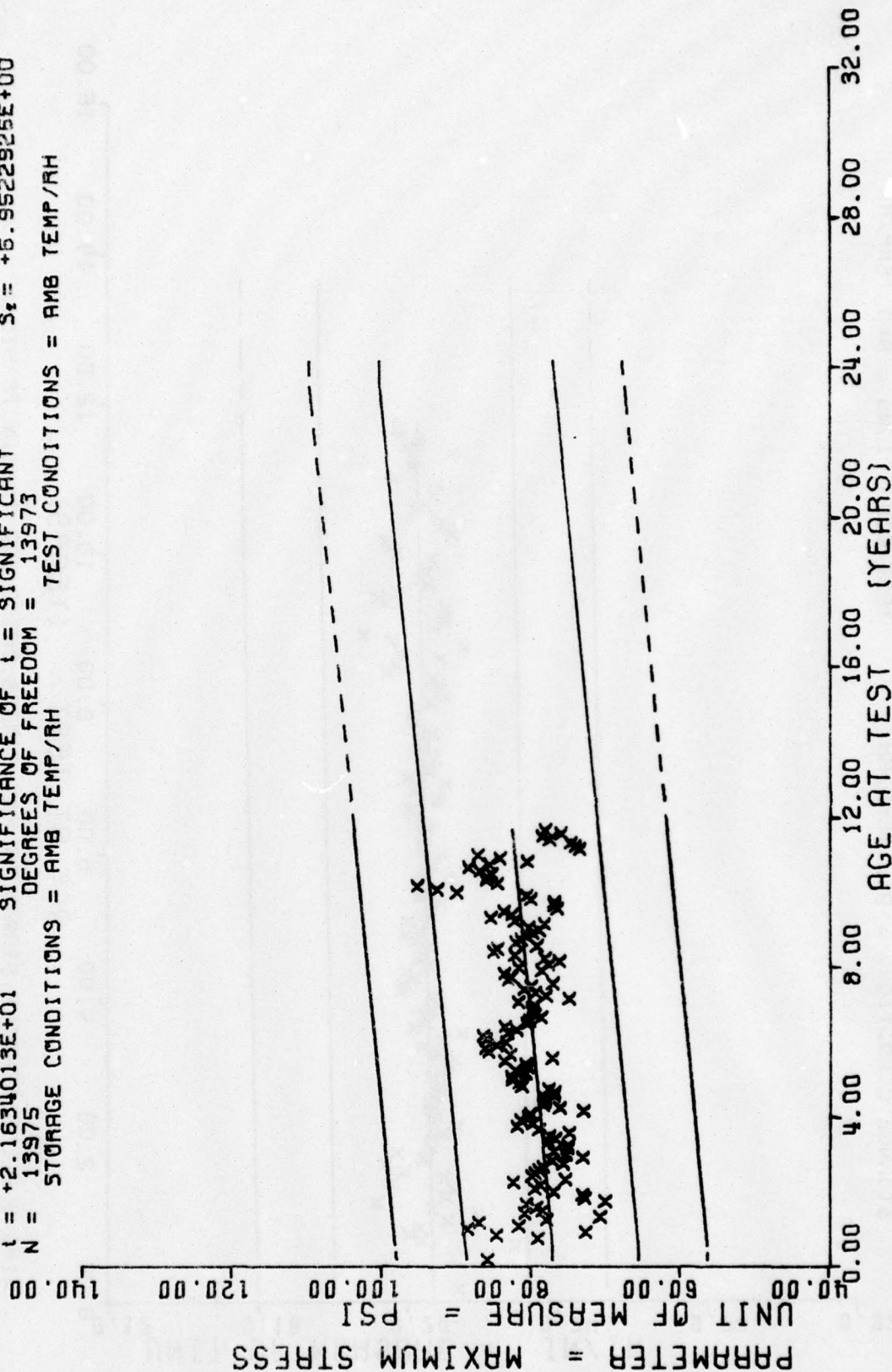
This sample size summary is applicable to figures 1 thru 3

$Y = (( +2.0707031E-01 ) + ( -3.1234687E-05 ) * X)$   
 $F = +5.4754545E+01$  SIGNIFICANCE OF F = SIGNIFICANT  $G_1 = +1.5585173E-02$   
 $R = -6.2476402E-02$  SIGNIFICANCE OF R = SIGNIFICANT  $G_2 = +4.2211139E-06$   
 $t = +7.3996314E+00$  SIGNIFICANCE OF t = SIGNIFICANT  $G_3 = +1.5555283E-02$   
 $N = 13975$  DEGREES OF FREEDOM = 13973  
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = AMB TEMP/RH



WING 6, V.L.R. TENSILE, STRAIN AT MAX STRESS, CHS=0.002 IN/MIN TP-H1011

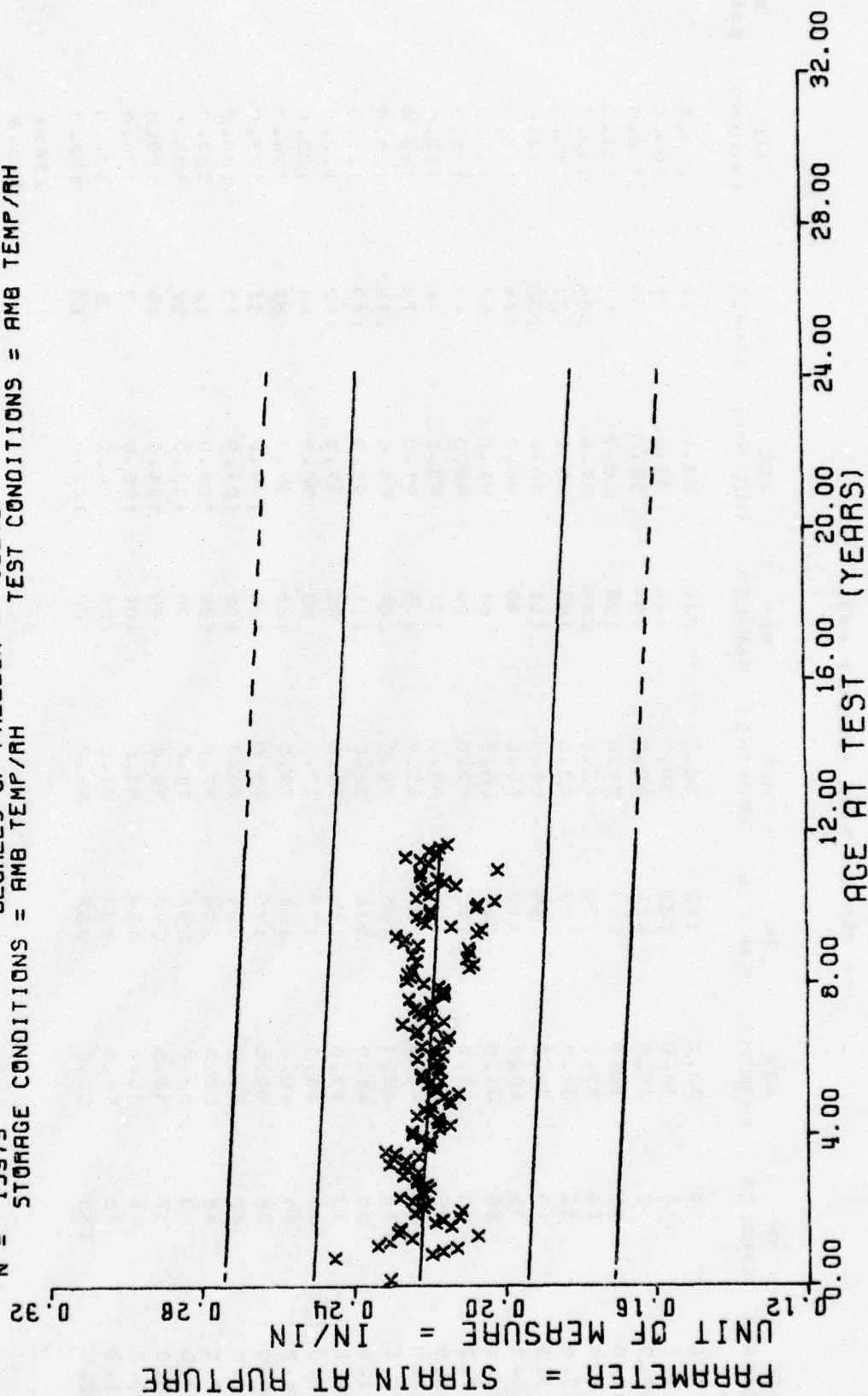
$Y = ((+7.7016082E+01) + (+4.0817945E-02) * X)$   
 $F = +4.6803065E+02$  SIGNIFICANCE OF F = SIGNIFICANT  
 $R = +1.8002715E-01$  SIGNIFICANCE OF R = SIGNIFICANT  
 $t = +2.1634013E+01$  SIGNIFICANCE OF t = SIGNIFICANT  
 $N = 13975$  DEGREES OF FREEDOM = 13973  
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = AMB TEMP/RH



WING 6, V.L.R. TENSILE, MAXIMUM STRESS, CHS=0.002 IN/MIN TP-H1011

Figure 2

$\gamma = ((+2.2315668E-01) + (-4.6806899E-05) * X)$   
 $F = +9.9667421E+01$  SIGNIFICANCE OF F = SIGNIFICANT  
 $R = -8.4156642E-02$  SIGNIFICANCE OF R = SIGNIFICANT  
 $t = +9.9833572E+00$  SIGNIFICANCE OF t = SIGNIFICANT  
 $N = 13975$  DEGREES OF FREEDOM = 13973  
 STORAGE CONDITIONS = AMB TEMP/AH TEST CONDITIONS = AMB TEMP/AH



WING 6,V.L.R. TENSILE, STRAIN AT RUPTURE, CHS=0.002 IN/MIN TP-H1011

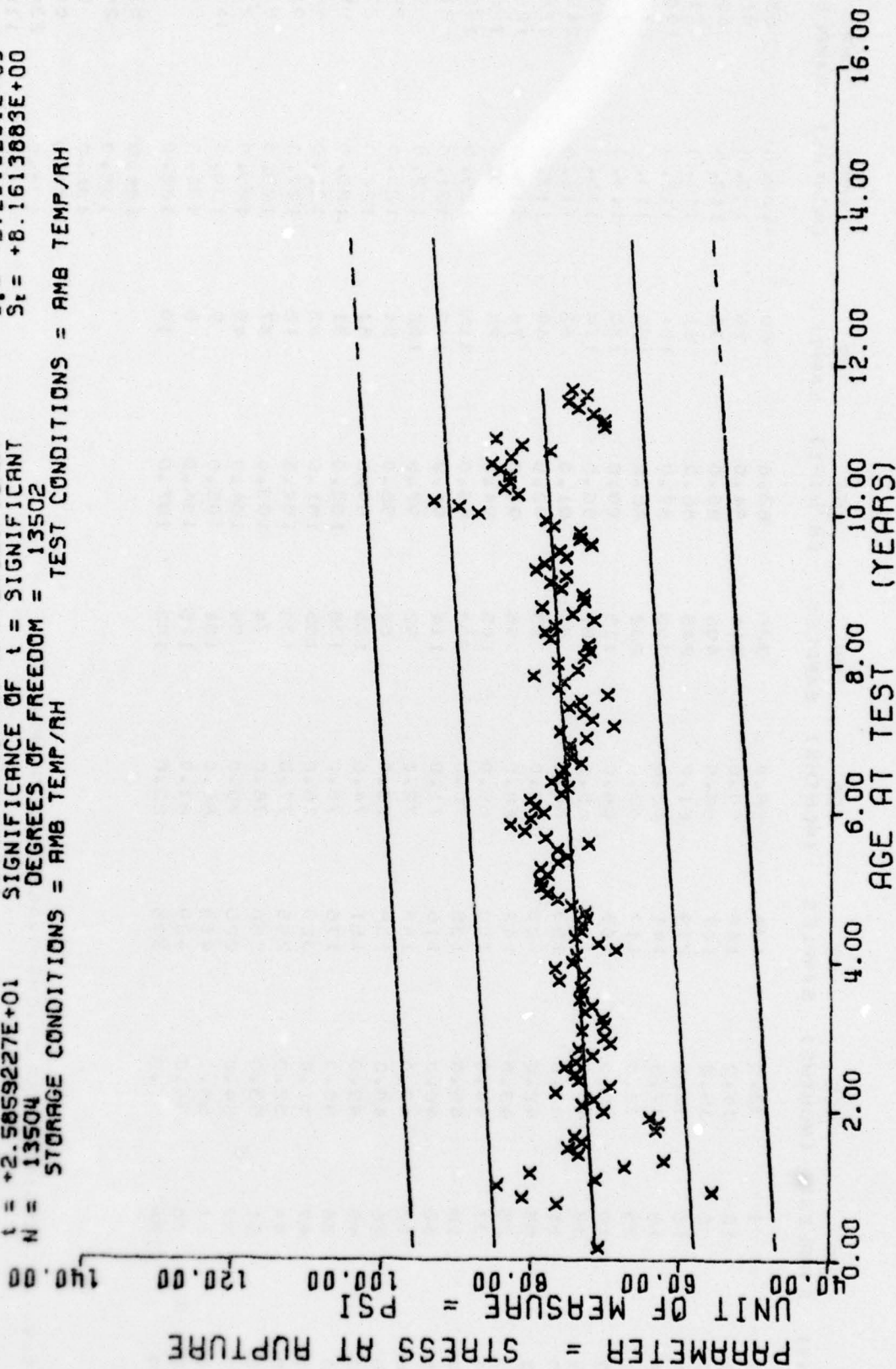
\*\*\* SAMPLE SIZE SUMMARY \*\*\*

AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES
2.0	1	33.0	122	58.0	249	83.0	60	108.0	63
9.0	10	34.0	133	59.0	220	84.0	26	109.0	96
10.0	5	35.0	104	60.0	294	85.0	30	110.0	42
11.0	15	36.0	209	61.0	198	86.0	61	111.0	21
12.0	15	37.0	132	62.0	265	87.0	104	112.0	100
13.0	30	38.0	102	63.0	193	88.0	121	113.0	223
14.0	10	39.0	96	64.0	111	89.0	130	114.0	70
15.0	35	40.0	113	65.0	90	90.0	114	115.0	65
16.0	25	41.0	146	66.0	61	91.0	62	116.0	243
17.0	55	42.0	112	67.0	24	92.0	49	117.0	223
18.0	25	43.0	120	68.0	101	93.0	78	118.0	125
19.0	37	44.0	97	69.0	165	94.0	78	119.0	126
20.0	18	45.0	135	70.0	204	95.0	115	120.0	168
21.0	50	46.0	116	71.0	111	96.0	149	121.0	102
22.0	12	47.0	148	72.0	95	97.0	102	122.0	9
23.0	46	48.0	138	73.0	62	98.0	84	123.0	39
24.0	49	49.0	151	74.0	125	99.0	81	124.0	27
25.0	36	50.0	176	75.0	138	100.0	31	125.0	66
26.0	47	51.0	329	76.0	105	101.0	63	126.0	44
27.0	44	52.0	296	77.0	130	102.0	12	127.0	92
28.0	50	53.0	256	78.0	76	103.0	37	128.0	51
29.0	37	54.0	226	79.0	99	104.0	45	129.0	27
30.0	61	55.0	468	80.0	101	105.0	9	130.0	142
31.0	70	56.0	437	81.0	125	106.0	5	131.0	68
32.0	133	57.0	367	82.0	102	107.0	10	132.0	3

WING 6.V.L.R.TFNSILE.STPRESS AT RUPTURE.CF5=0.002 IN/MIN TP-H1011

This sample size summary is applicable to figure 4

$Y = \{ (+7.1391920E+01) + (+5.7700293E-02) * X \}$   
 $F = +6.6869965E+02$  SIGNIFICANCE OF F = SIGNIFICANT  $\sigma_s = +8.3607369E+00$   
 $R = +2.1723005E-01$  SIGNIFICANCE OF R = SIGNIFICANT  $S_s = +2.2313231E-03$   
 $t = +2.5859227E+01$  SIGNIFICANCE OF t = SIGNIFICANT  $S_t = +8.1613683E+00$   
 $N = 13504$  DEGREES OF FREEDOM = 13502  
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = AMB TEMP/RH



WING 6, V.L.R. TENSILE STRESS AT RUPTURE, CHS=0.002 IN/MIN TP-H1011

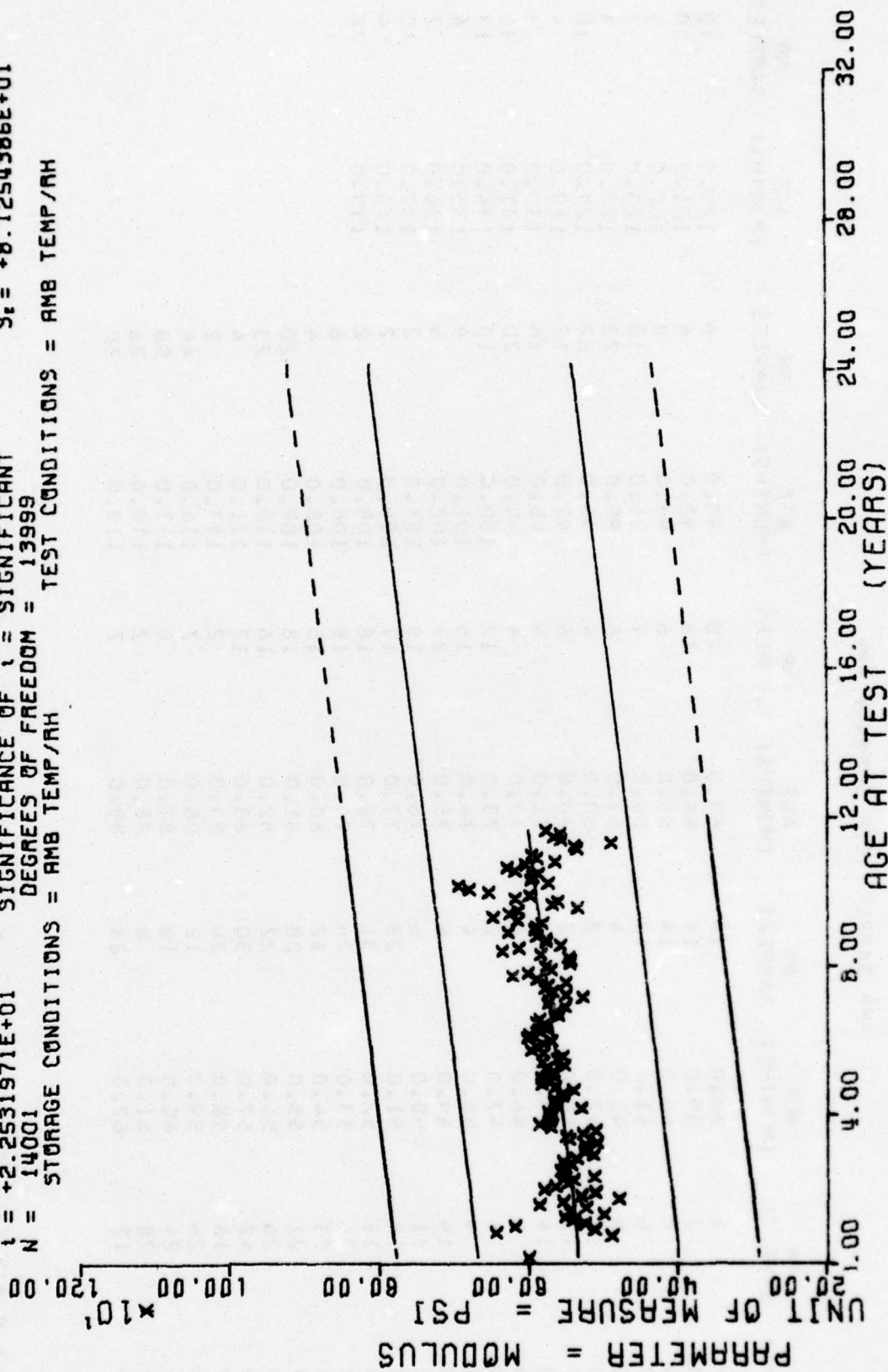
Figure 4

[illegible]

WING 6,V.L.R.TENSILE,MODULUS,CH5=0.002 IN/MIN TP-H1011

This sample size summary is applicable to figure 5

$Y = ((+5.3908193E+02) + (+4.9830372E-01) \cdot X)$   
 $F = +5.0768974E+02$  SIGNIFICANCE OF F = SIGNIFICANT  
 $R = +1.8707468E-01$  SIGNIFICANCE OF R = SIGNIFICANT  
 $t = +2.2531971E+01$  SIGNIFICANCE OF t = SIGNIFICANT  
 $N = 14001$  DEGREES OF FREEDOM = 13999  
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = AMB TEMP/RH



WING 6, V.L.R. TENSILE MODULUS, CHS=0.002 IN/MIN TP-H1011

Figure 5

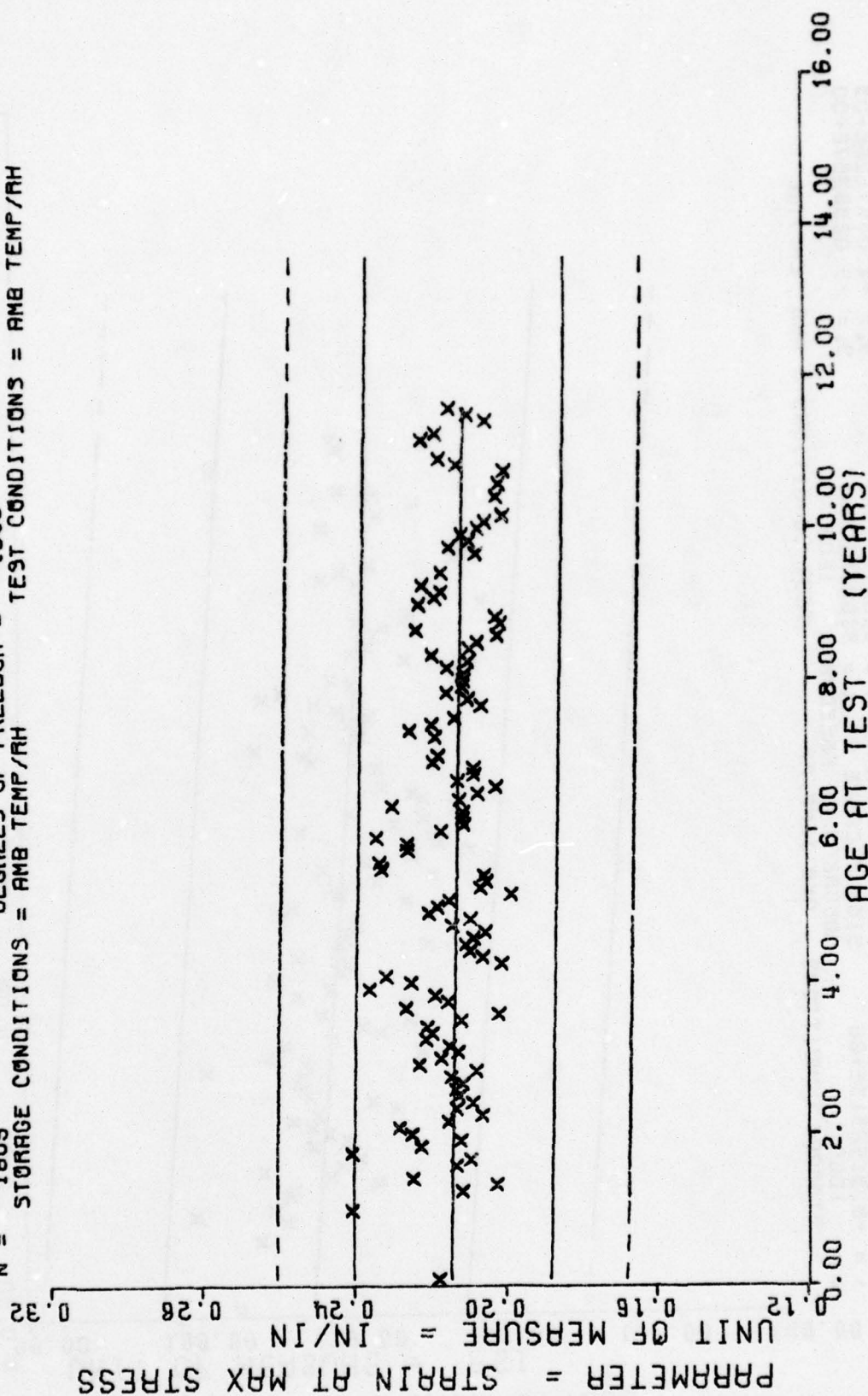
\*\*\* SAMPLE SIZE SUMMARY \*\*\*

AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES
1.0	1	38.0	10	63.0	28	90.0	6	120.0	40		
12.0	2	39.0	14	64.0	16	92.0	6	121.0	30		
13.0	2	40.0	14	65.0	6	93.0	8	122.0	4		
15.0	6	41.0	12	66.0	7	94.0	18	123.0	2		
16.0	6	42.0	6	67.0	6	95.0	22	125.0	4		
17.0	12	43.0	2	69.0	4	96.0	20	127.0	10		
19.0	10	44.0	2	70.0	6	97.0	12	129.0	4		
20.0	14	45.0	4	71.0	4	98.0	16	130.0	8		
21.0	6	46.0	6	72.0	4	99.0	20	131.0	36		
22.0	6	47.0	2	73.0	12	100.0	10	134.0	13		
23.0	9	48.0	4	74.0	16	101.0	4	135.0	4		
24.0	14	49.0	4	75.0	23	102.0	6	136.0	2		
25.0	11	50.0	6	76.0	10	103.0	2	137.0	10		
26.0	16	51.0	28	77.0	17	104.0	2	138.0	54		
27.0	18	52.0	31	78.0	18	105.0	2	139.0	28		
28.0	26	53.0	24	79.0	16	106.0	6				
29.0	23	54.0	12	80.0	15	108.0	4				
30.0	22	55.0	28	81.0	18	109.0	20				
31.0	26	56.0	22	82.0	16	110.0	23				
32.0	42	57.0	30	83.0	12	111.0	4				
33.0	18	58.0	26	84.0	2	113.0	2				
34.0	26	59.0	12	85.0	2	116.0	44				
35.0	24	60.0	18	87.0	4	117.0	58				
36.0	28	61.0	8	88.0	2	118.0	26				
37.0	12	62.0	28	89.0	2	119.0	30				

WING 6,L.R.BIAXIAL TENSILE,STRAIN AT MAX STRESS,CHS=0.2 IN/MIN TPH-1011

This sample size summary is applicable to figures 6 thru 10

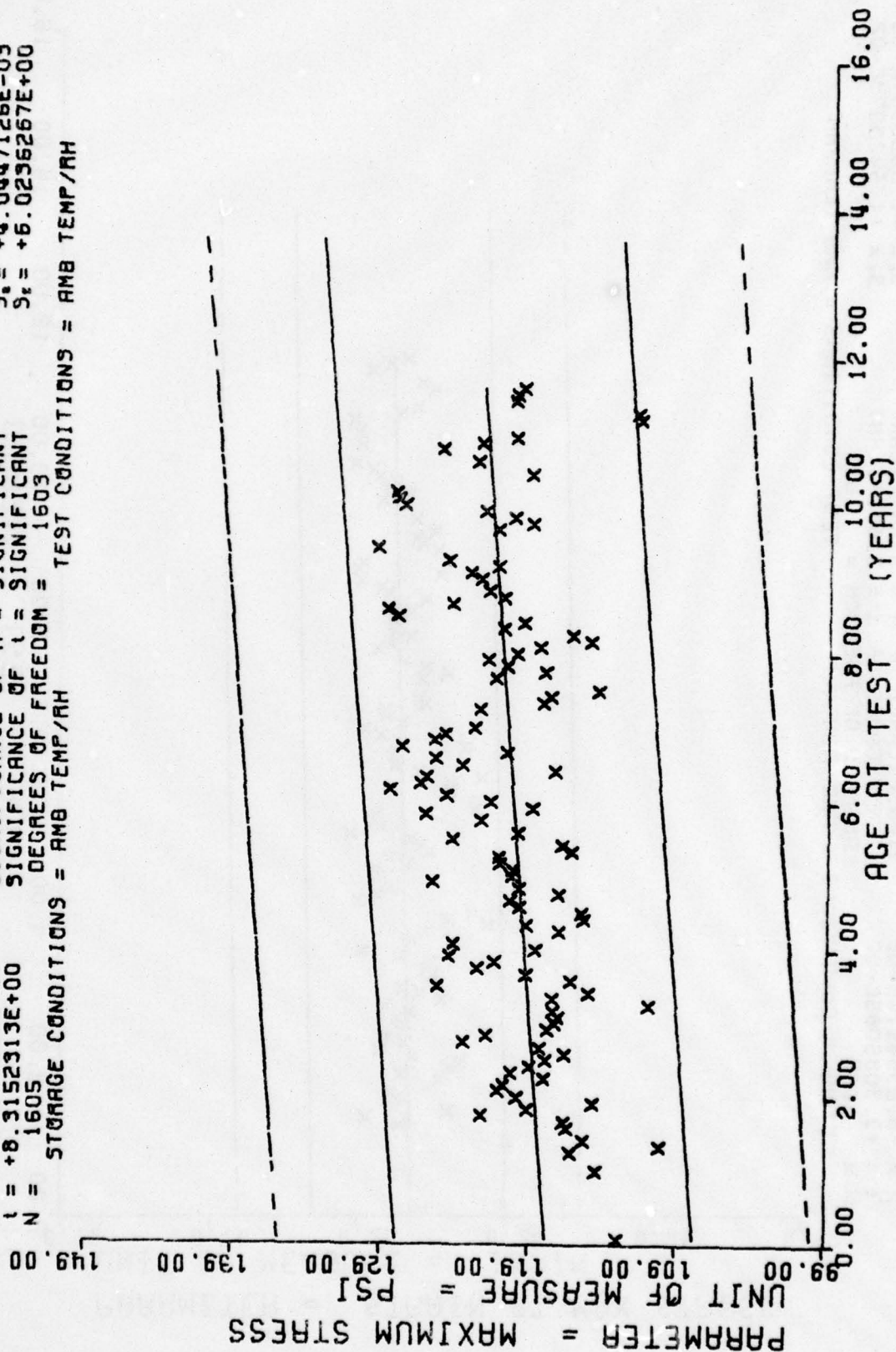
$\gamma = ((+2.1475995E-01) + (-3.4265584E-05) \times X)$   
 $F = +1.0946228E+01$  SIGNIFICANCE OF F = SIGNIFICANT  $\zeta = +1.5471720E-02$   
 $R = -8.2354574E-02$  SIGNIFICANCE OF R = SIGNIFICANT  $\eta = +1.0356807E-05$   
 $t = +3.3085085E+00$  SIGNIFICANCE OF t = SIGNIFICANT  $\eta = +1.5423979E-02$   
 $N = 1605$  DEGREES OF FREEDOM = 1603  
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = AMB TEMP/RH



WING 6.L.R.BIAXIAL TENSILE, STRAIN AT MAX STRESS, CHS=0.2 IN/MIN TPH-1011

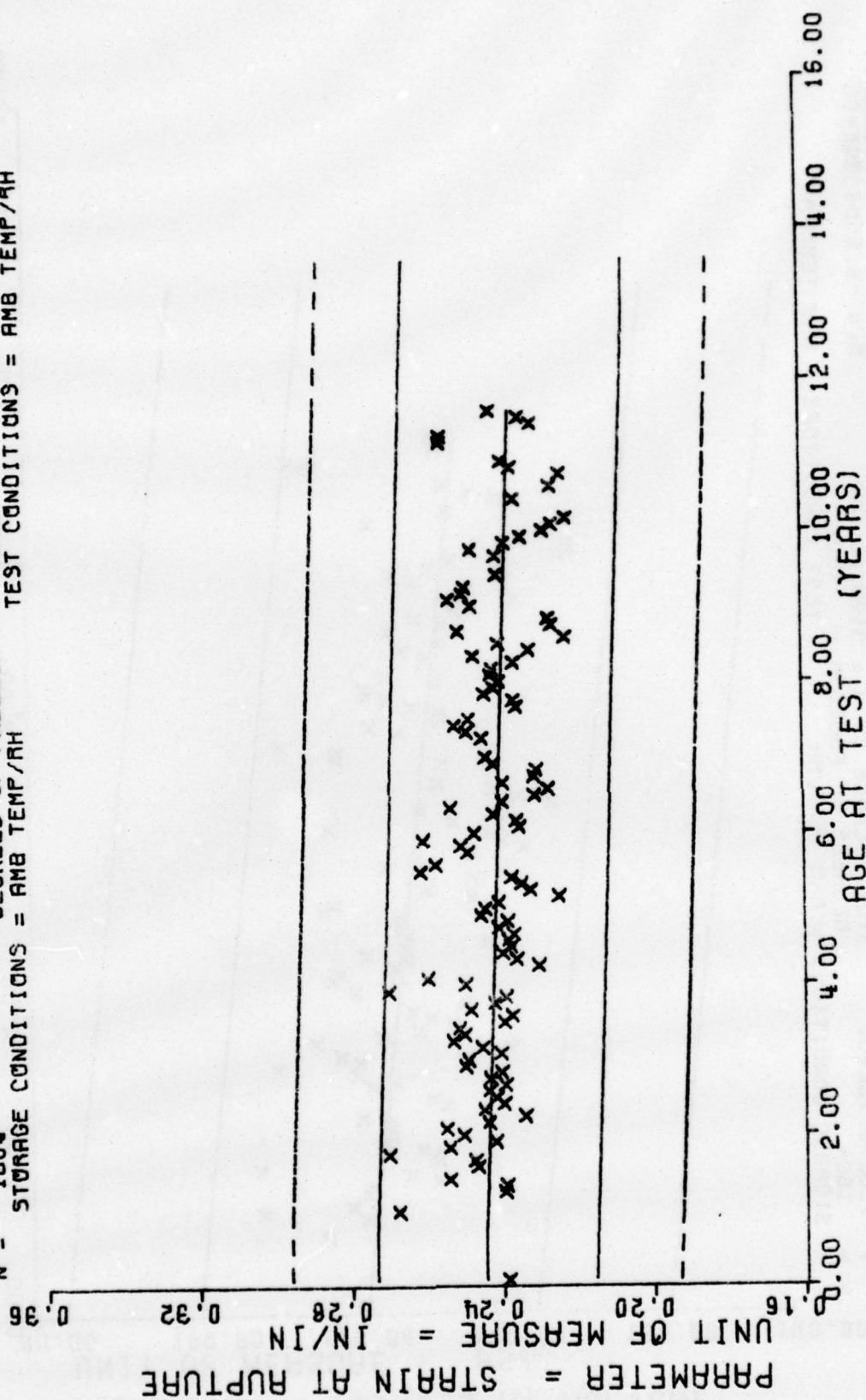
Figure 6

$Y = ((+1.1791221E+02) + (+3.3632721E-02) * X)$   
 $F = +6.9143071E+01$  SIGNIFICANCE OF F = SIGNIFICANT  $\sigma_1 = +6.1502473E+00$   
 $R = +2.0394692E-01$  SIGNIFICANCE OF R = SIGNIFICANT  $S_e = +4.0447126E-03$   
 $t = +8.3152313E+00$  SIGNIFICANCE OF t = SIGNIFICANT  $S_e = +5.0236267E+00$   
 $N = 1605$  DEGREES OF FREEDOM = 1603  
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = AMB TEMP/RH



WING 6.L.R. BIAXIAL TENSILE, MAXIMUM STRESS, CHS=0.2 IN/MIN TPH-1011

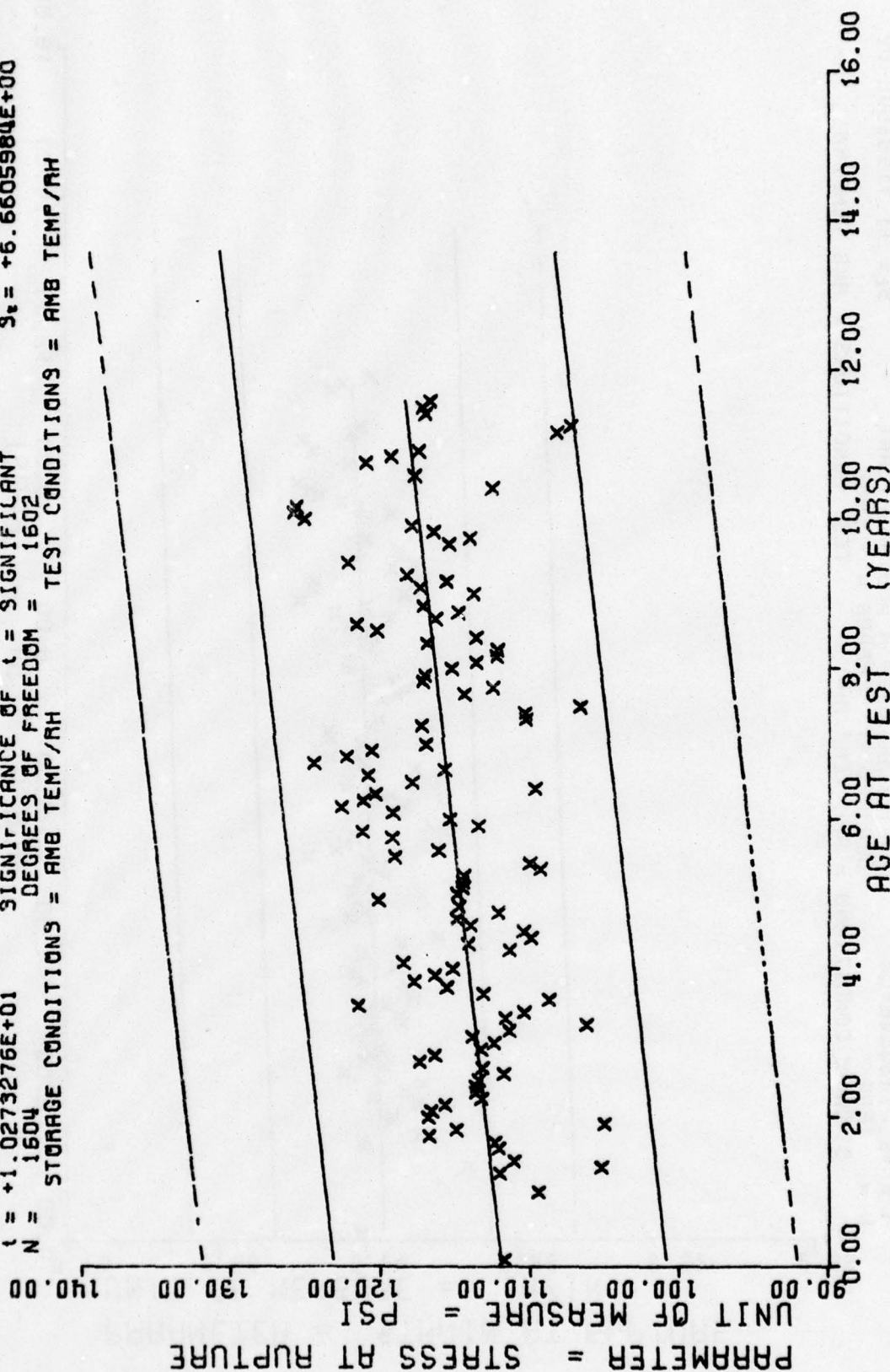
$F = +2.7194623E+01$   
 $R = -1.2919777E-01$   
 $t = +5.2148464E+00$   
 $N = 1604$   
 $Y = ((+2.4511088E-01) + (-6.0089004E-05) \times X)$   
 SIGNIFICANCE OF F = SIGNIFICANT  
 SIGNIFICANCE OF R = SIGNIFICANT  
 SIGNIFICANCE OF t = SIGNIFICANT  
 DEGREES OF FREEDOM = 1602  
 STORAGE CONDITIONS = AMB TEMP/RH  
 TEST CONDITIONS = AMB TEMP/RH



WING G.L.A. BIAxIAL TENSILE, STRAIN AT RUPTURE, CHS=0.2 IN/MIN TPH-1011

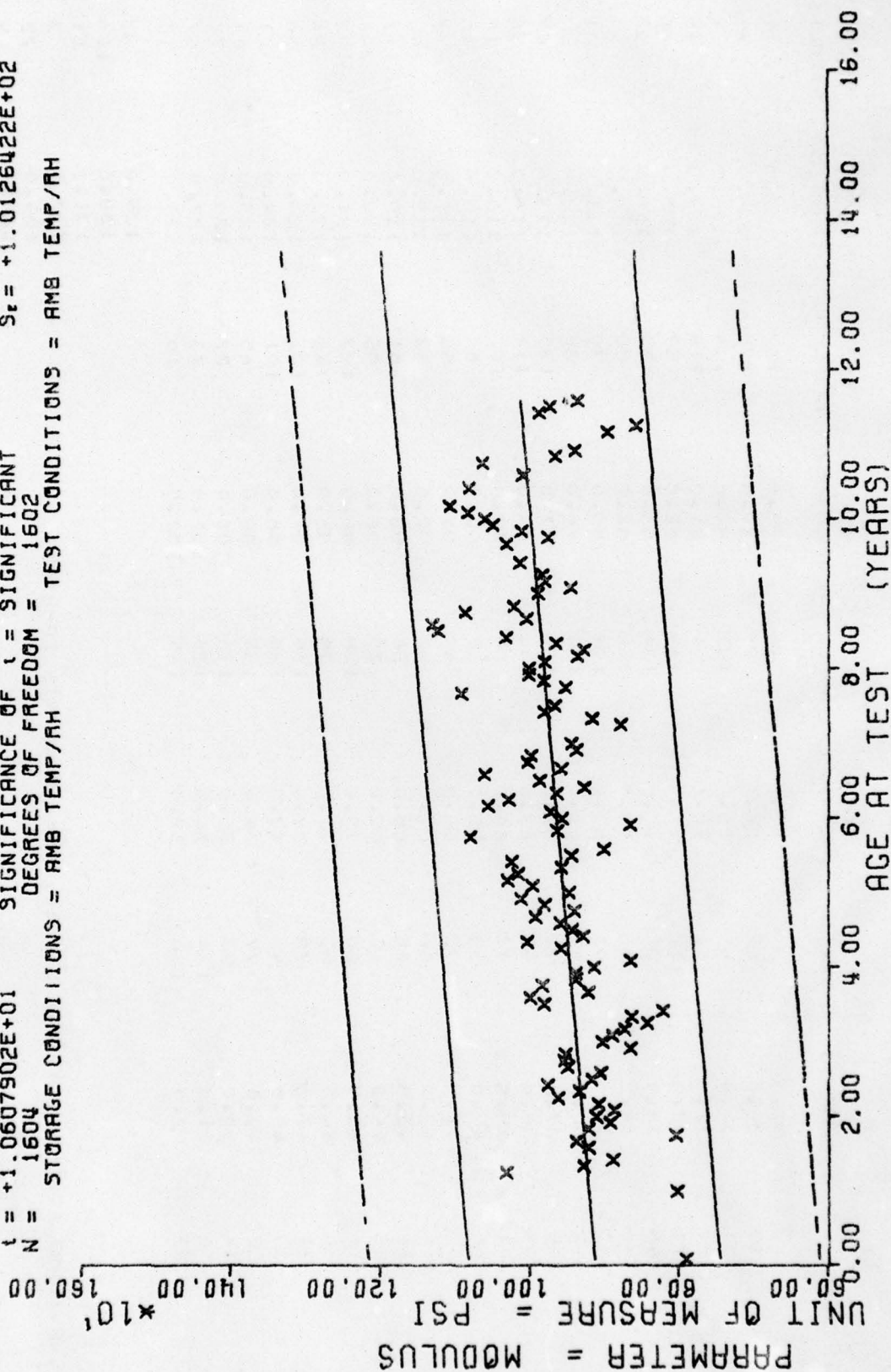
Figure 8

$F = +1.0554021E+02$   
 $R = +2.4861281E-01$   
 $t = +1.0273276E+01$   
 $N = 1604$   
 $Y = [(+1.1203698E+02) + (+4.5965472E-02) \cdot X]$   
 SIGNIFICANCE OF F = SIGNIFICANT  
 SIGNIFICANCE OF R = SIGNIFICANT  
 SIGNIFICANCE OF t = SIGNIFICANT  
 DEGREES OF FREEDOM = 1602  
 STORAGE CONDITIONS = AMB TEMP/RH  
 TEST CONDITIONS = AMB TEMP/RH



WING 6.L.R. BIAXIAL TENSILE STRESS AT RUPTURE, CHS=0.2 IN/MIN TPH-1011

$\gamma = ((+9.1971927E+02) + (+7.2184979E-01) \times X1)$   
 $F = +1.1252760E+02$  SIGNIFICANCE OF F = SIGNIFICANT  $G_1 = +1.0472768E+02$   
 $R = +2.5618712E-01$  SIGNIFICANCE OF R = SIGNIFICANT  $S_0 = +5.8048303E-02$   
 $t = +1.0607902E+01$  SIGNIFICANCE OF t = SIGNIFICANT  $S_t = +1.0126422E+02$   
 $N = 1604$  DEGREES OF FREEDOM = 1602  
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = AMB TEMP/RH



WING 6, L.R. BIAxIAL TENSILE, MODULUS, CHS=0.2 IN/MIN TPH-1011

Figure 10

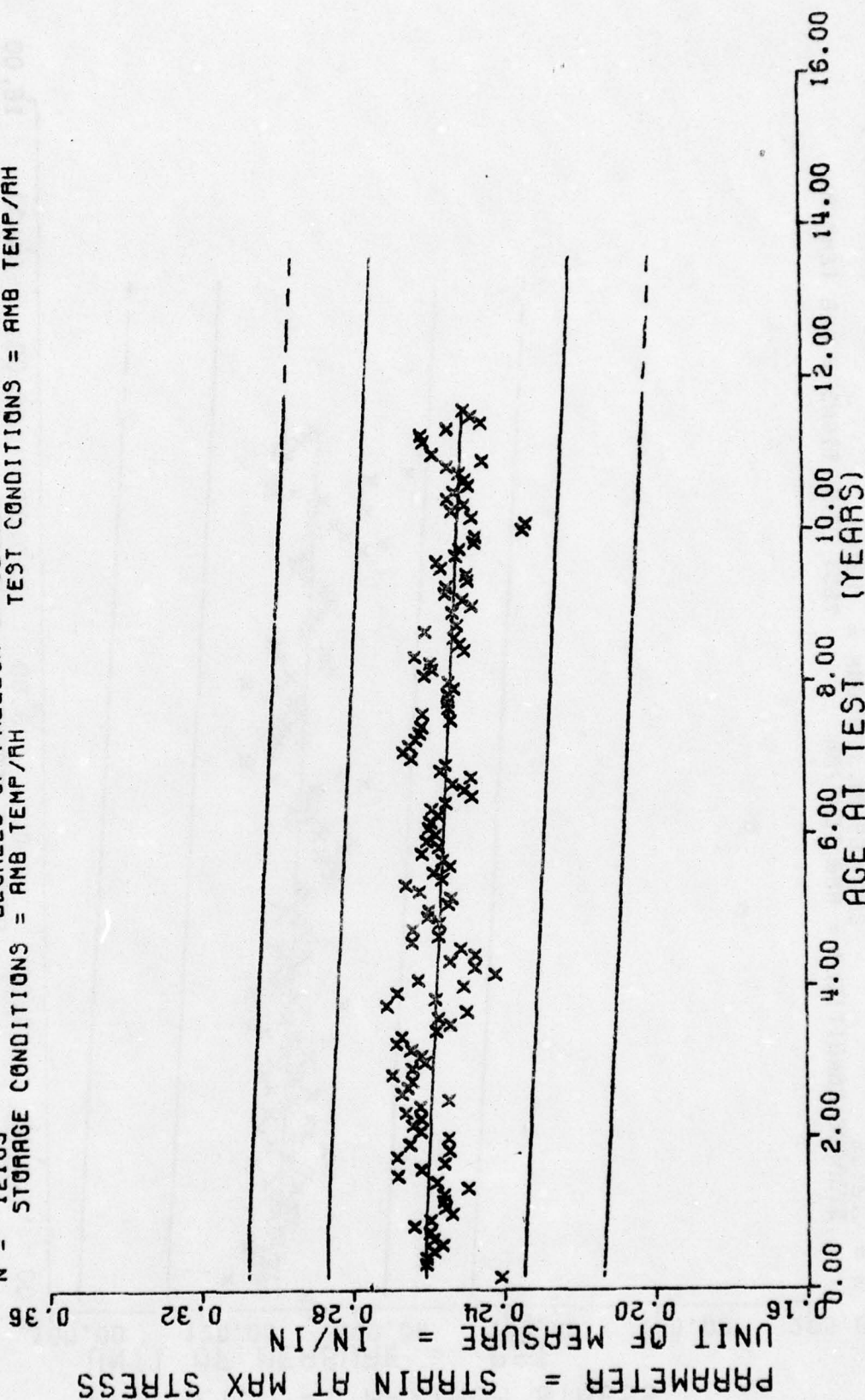
\*\*\* SAMPLE SIZE SUMMARY \*\*\*

	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES
	2.0	3	28.0	70	57.0	76	73.0	162	103.0	35
	4.0	37	29.0	52	54.0	77	70.0	108	104.0	45
	5.0	151	30.0	40	55.0	137	80.0	114	105.0	9
	6.0	101	31.0	52	56.0	91	81.0	118	107.0	15
	7.0	171	32.0	112	57.0	145	82.0	57	109.0	66
	8.0	140	33.0	85	58.0	134	83.0	79	109.0	93
	9.0	105	34.0	75	59.0	102	84.0	20	110.0	41
	10.0	193	35.0	41	60.0	109	85.0	30	111.0	21
	11.0	192	36.0	193	61.0	150	86.0	38	112.0	57
	12.0	106	37.0	77	62.0	185	87.0	135	113.0	67
	13.0	195	38.0	36	63.0	244	88.0	114	114.0	38
	14.0	201	39.0	72	64.0	89	89.0	107	115.0	18
1	15.0	178	40.0	59	65.0	53	90.0	60	116.0	246
26	16.0	203	41.0	32	66.0	40	91.0	55	117.0	217
1	17.0	160	42.0	60	67.0	55	92.0	53	118.0	143
	18.0	18	43.0	75	68.0	50	93.0	61	119.0	117
	19.0	55	44.0	15	69.0	70	94.0	95	120.0	204
	20.0	16	45.0	20	70.0	120	95.0	103	121.0	93
	21.0	60	46.0	55	71.0	75	96.0	148	122.0	24
	22.0	31	47.0	70	72.0	119	97.0	101	123.0	30
	23.0	30	48.0	40	73.0	120	98.0	101	124.0	21
	24.0	65	49.0	77	74.0	154	99.0	65	125.0	42
	25.0	30	50.0	93	75.0	175	100.0	27	125.0	72
	26.0	56	51.0	154	76.0	125	101.0	73	127.0	57
	27.0	53	52.0	196	77.0	145	102.0	10	128.0	33
									129.0	33
									130.0	126
									131.0	51
									132.0	3
									134.0	72
									135.0	9
									136.0	15
									137.0	54
									138.0	246
									139.0	123

WING 6,L.R.TENSILE,STRAIN AT MAX STRESS,CHS=2.0 IN/MIN TP-H1011

This sample size summary is applicable to figures 11 thru 15

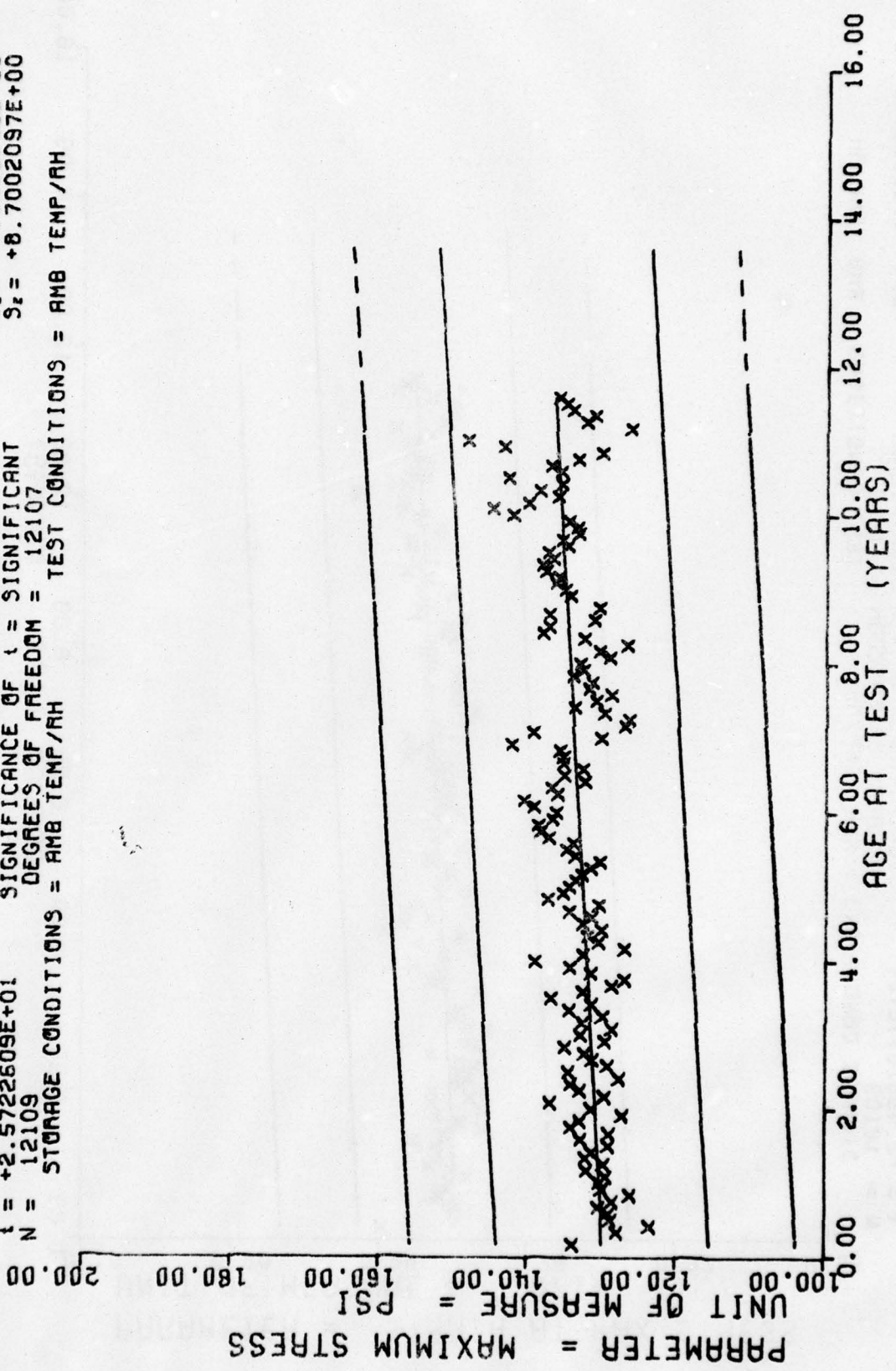
$Y = ((+2.6154677E-01) + (-8.8923239E-05) * X)$   
 $F = +6.0275245E+02$  SIGNIFICANCE OF F = SIGNIFICANT  $G_1 = +1.6071660E-02$   
 $R = -2.1777145E-01$  SIGNIFICANCE OF R = SIGNIFICANT  $S_0 = +3.5975388E-06$   
 $t = +2.4551017E+01$  SIGNIFICANCE OF t = SIGNIFICANT  $S_1 = +1.5686584E-02$   
 $N = 12109$  DEGREES OF FREEDOM = 12107  
 STORAGE CONDITIONS = AMB TEMP/AH TEST CONDITIONS = AMB TEMP/AH



WING 6.L.R. TENSILE. STRAIN AT MAX STRESS, CHS=2.0 IN/MIN TP-H1011

Figure 11

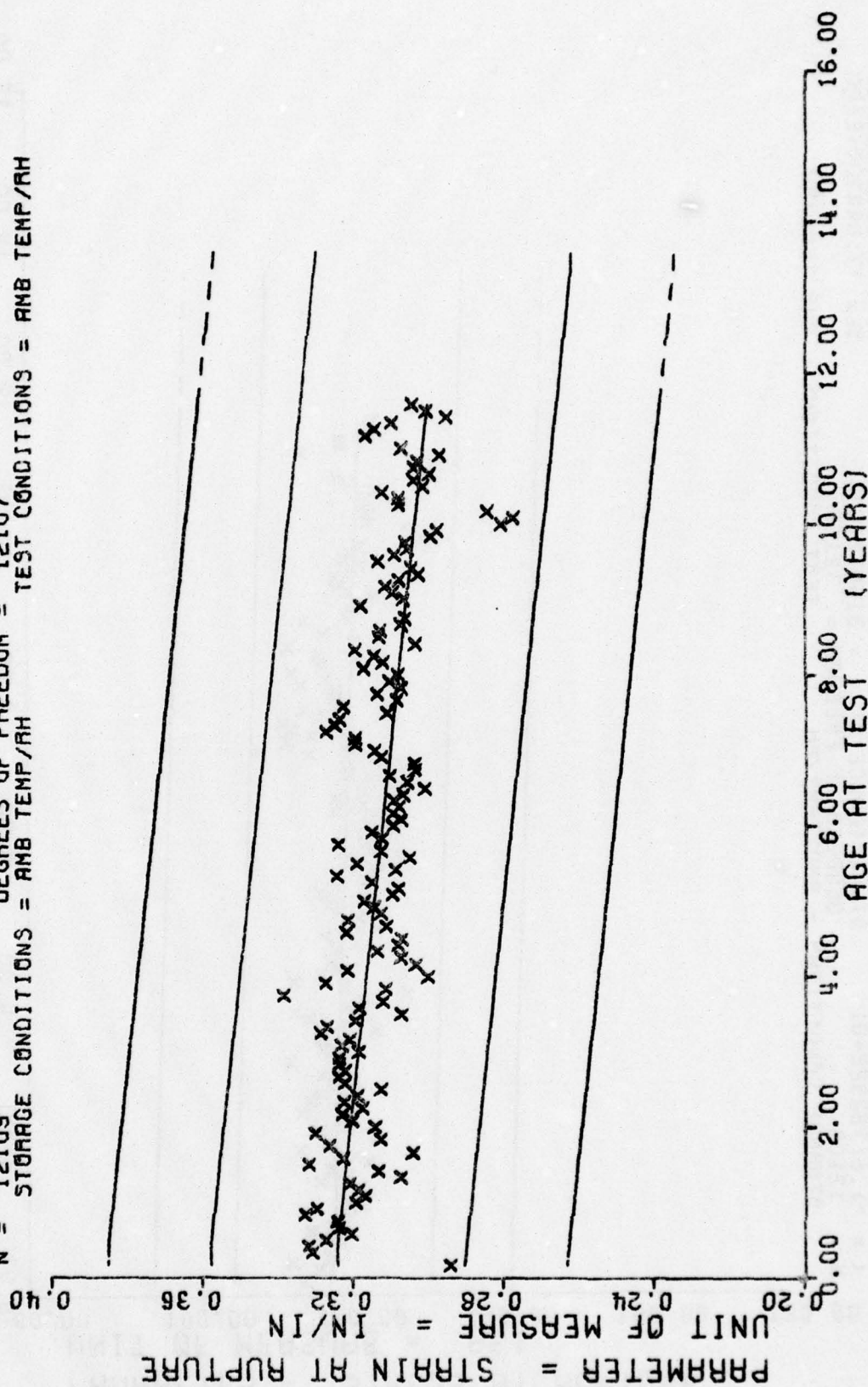
$Y = (( +1.2973087E+02 ) + ( +5.1324158E-02 ) * X)$   
 SIGNIFICANCE OF F = SIGNIFICANT  
 SIGNIFICANCE OF R = SIGNIFICANT  
 SIGNIFICANCE OF t = SIGNIFICANT  
 DEGREES OF FREEDOM = 12107  
 N = 12109  
 STORAGE CONDITIONS = AMB TEMP/RH  
 TEST CONDITIONS = AMB TEMP/RH  
 $\sigma_1 = +8.9344135E+00$   
 $\sigma_2 = +1.9952936E-03$   
 $\sigma_3 = +8.7002097E+00$



WING 6.L.A. TENSILE, MAXIMUM STRESS, CHS=2.0 IN/MIN TP-H1011

Figure 12

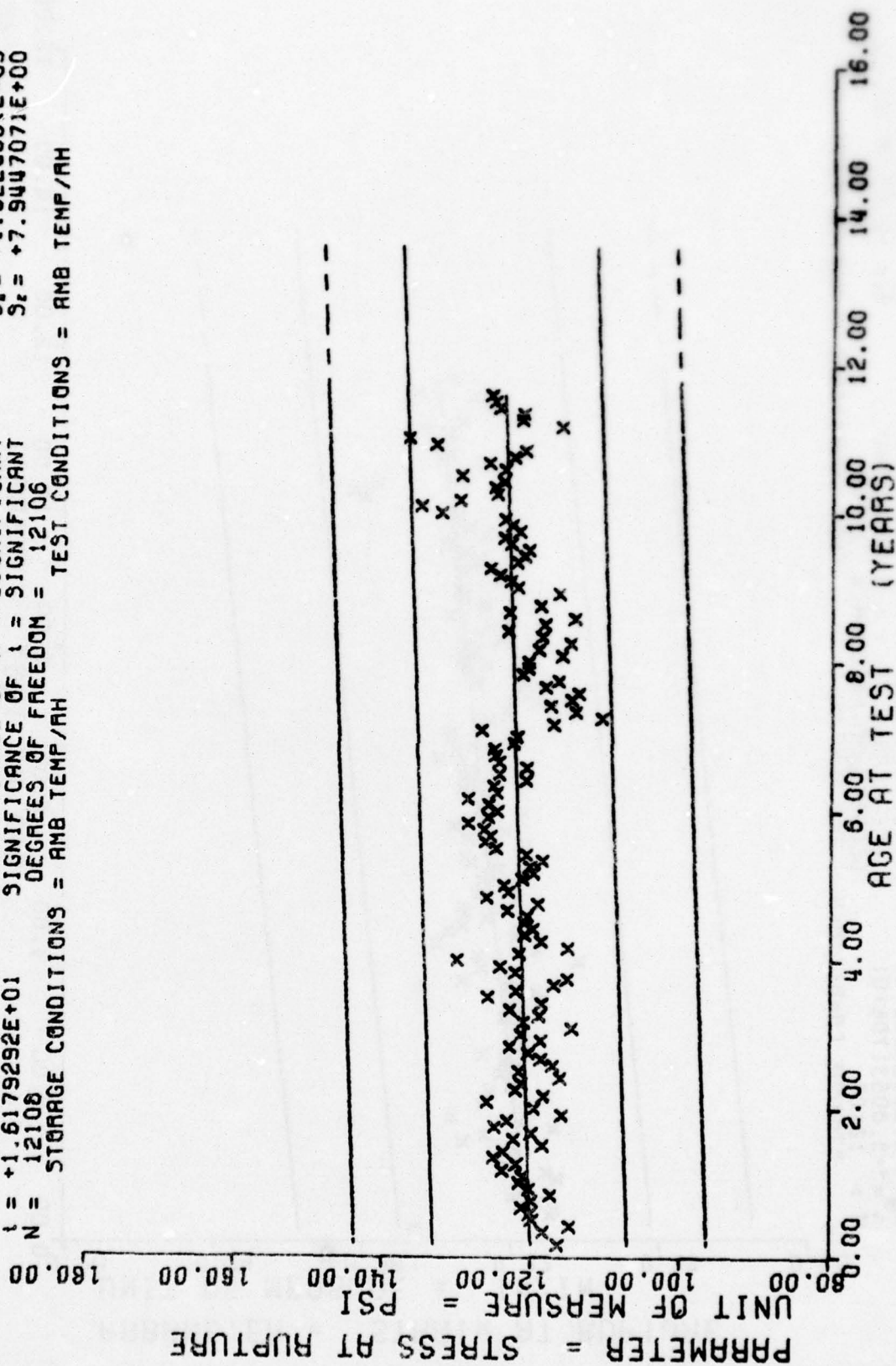
$\gamma = ((+3.2491502E-01) + (-1.7763163E-04) \times X)$   
 $F = +1.4488049E+09$  SIGNIFICANCE OF F = SIGNIFICANT  
 $R = -3.2692061E-01$  SIGNIFICANCE OF R = SIGNIFICANT  
 $t = +3.8063170E+01$  SIGNIFICANCE OF t = SIGNIFICANT  
 $N = 12109$  DEGREES OF FREEDOM = 12107  
 STORAGE CONDITIONS = AMB TEMP/AH TEST CONDITIONS = AMB TEMP/AH



WING 6.L.A. TENSILE, STRAIN AT RUPTURE, CHS=2.0 IN/MIN TP-H1011

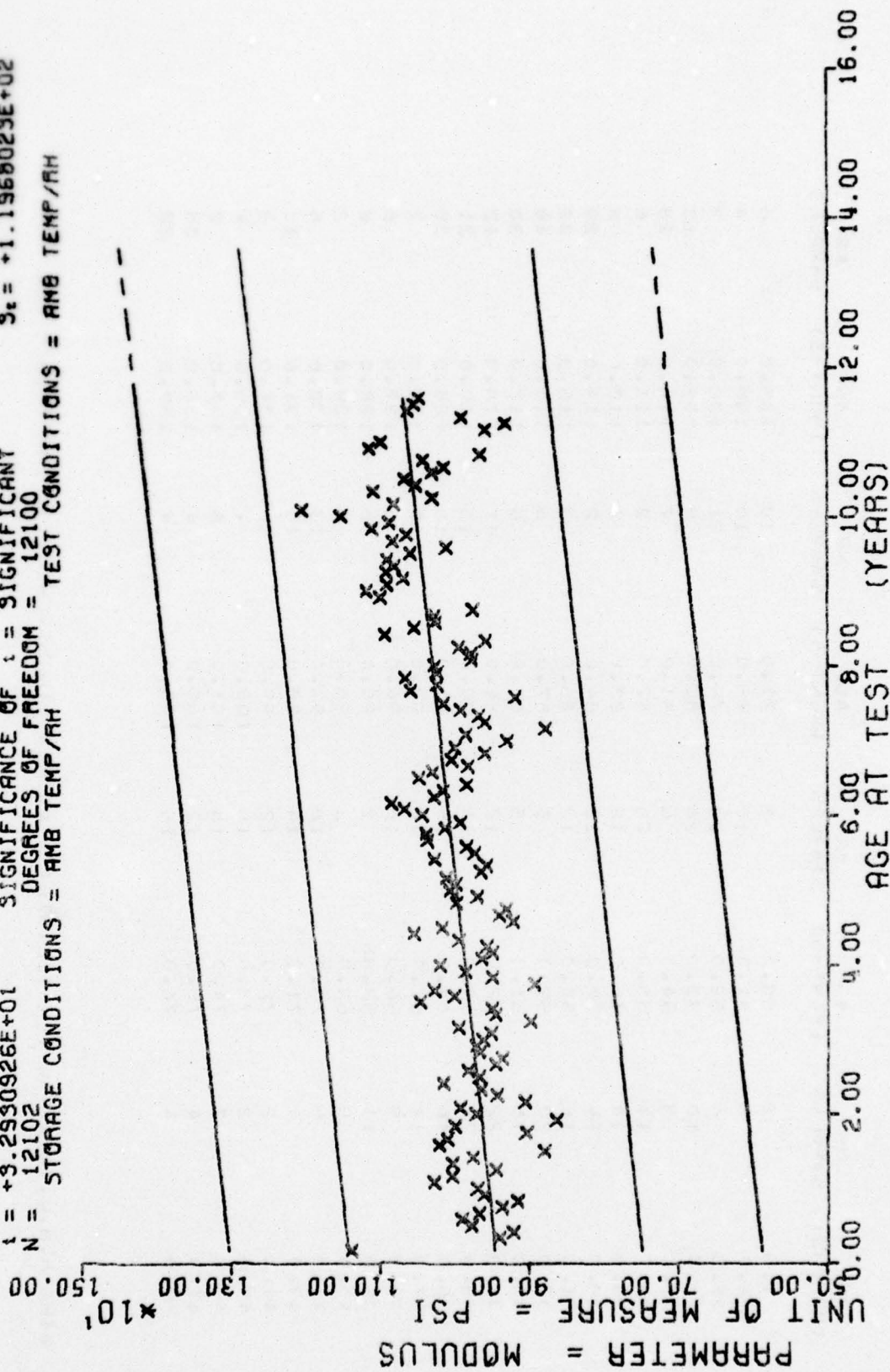
Figure 13

$F = +2.6176948E+02$   
 $R = +1.4548352E-01$   
 $t = +1.6179292E+01$   
 $N = 12108$   
 $Y = (( +1.2011353E+02 ) + ( +2.9479286E-02 ) * X)$   
 SIGNIFICANCE OF F = SIGNIFICANT  
 SIGNIFICANCE OF R = SIGNIFICANT  
 SIGNIFICANCE OF t = SIGNIFICANT  
 DEGREES OF FREEDOM = 12106  
 STORAGE CONDITIONS = AMB TEMP/AH  
 TEST CONDITIONS = AMB TEMP/AH



WING 6, L.R. TENSILE STRESS AT RUPTURE, CHS=2.0 IN/MIN TP-H1011

$\gamma = ((+9.4455009E+02) + (+9.0987535E-01) \times X)$   
 $F = +1.0844458E+09$  SIGNIFICANCE OF F = SIGNIFICANT  
 $R = +2.8679594E-01$  SIGNIFICANCE OF R = SIGNIFICANT  
 $t = +9.2930926E+01$  SIGNIFICANCE OF t = SIGNIFICANT  
 $N = 12102$  DEGREES OF FREEDOM = 12100  
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = AMB TEMP/RH



WING 6.L.R.TENSILE,MODULUS,CHS=2.0 IN/MIN TP-H1011

Figure 15

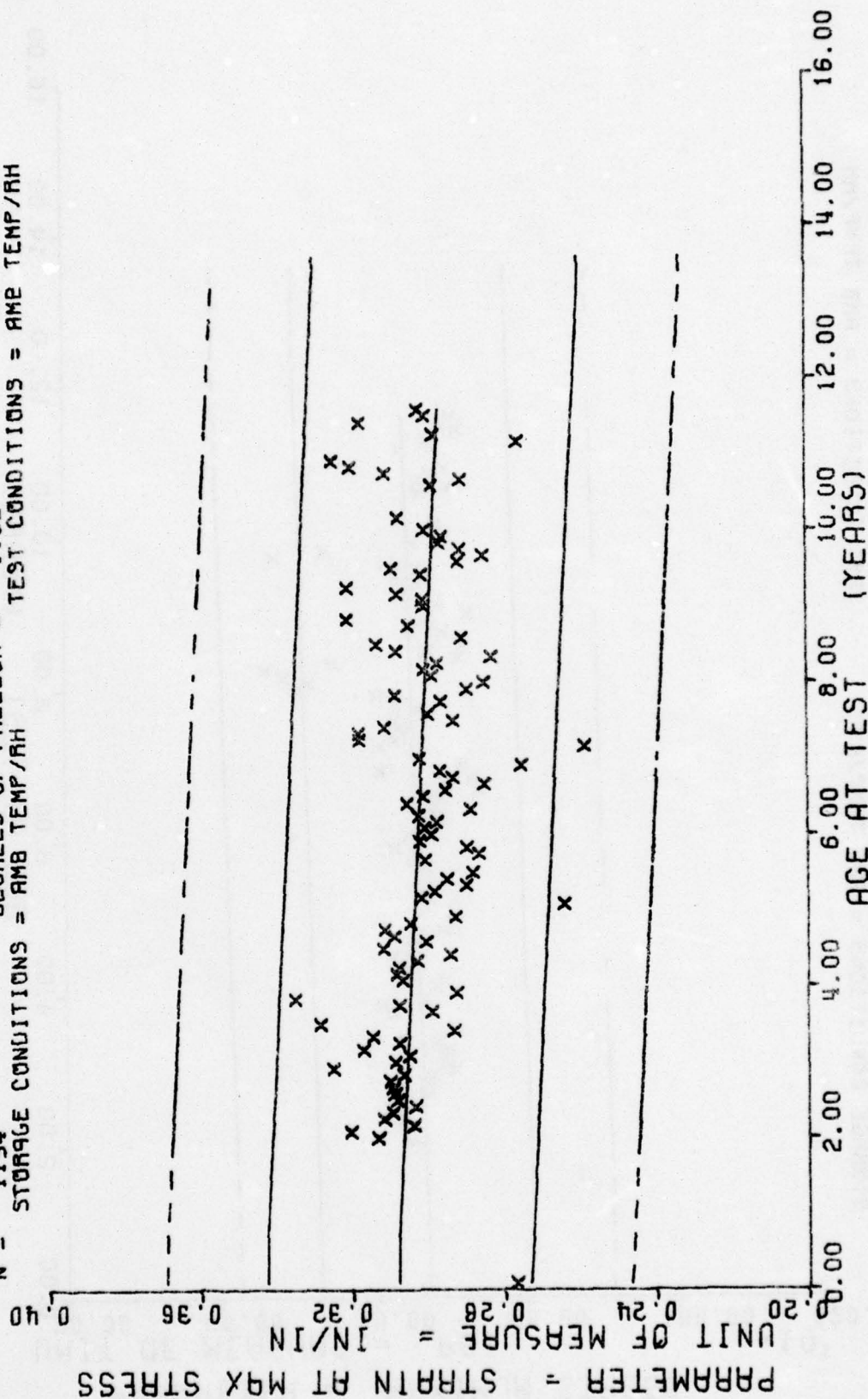
\*\*\* SAMPLE SIZE SUMMARY \*\*\*

AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES
1.0	2	50.0	8	77.0	10	105.0	6
24.0	6	51.0	15	78.0	10	106.0	4
25.0	6	52.0	24	79.0	21	108.0	2
26.0	10	53.0	26	80.0	8	109.0	13
27.0	3	54.0	6	81.0	7	110.0	28
28.0	11	55.0	26	82.0	12	111.0	6
29.0	14	56.0	12	83.0	2	113.0	8
30.0	14	57.0	22	84.0	2	114.0	29
31.0	16	58.0	12	86.0	3	115.0	32
32.0	23	59.0	5	87.0	6	116.0	46
33.0	15	61.0	5	88.0	8	117.0	30
34.0	22	62.0	12	89.0	11	118.0	12
35.0	22	63.0	13	90.0	13	119.0	21
36.0	16	64.0	16	91.0	10	120.0	35
37.0	14	65.0	18	93.0	10	122.0	2
38.0	9	66.0	10	94.0	8	127.0	6
39.0	11	68.0	2	95.0	8	128.0	2
40.0	9	69.0	2	96.0	6	129.0	2
41.0	6	70.0	10	97.0	13	130.0	6
42.0	4	71.0	14	98.0	10	131.0	12
44.0	2	72.0	12	99.0	6	134.0	2
45.0	2	73.0	18	100.0	4	135.0	4
46.0	2	74.0	18	101.0	6	137.0	2
47.0	4	75.0	12	102.0	4	138.0	35
49.0	4	76.0	16	103.0	4	139.0	23

WING 6,H.R., TRIAXIAL TENSILE, STRAIN AT MAX STRESS, CHS=1750 IN/MIN, 800 PSI

This sample size summary is applicable to figures 16 thru 20

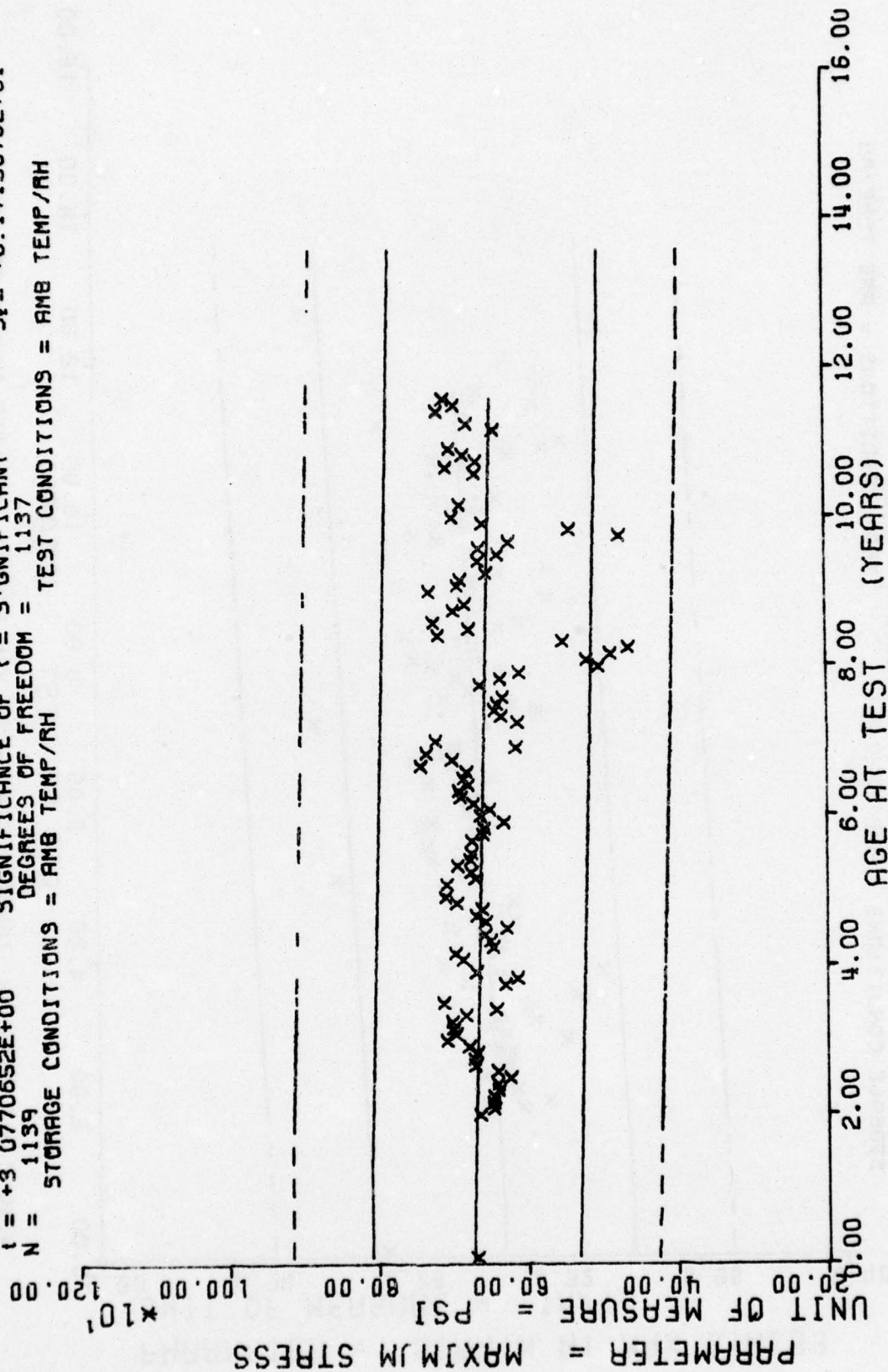
$\gamma = ((+3.0844073E-01) + (-8.730529E-05) \times X)$   
 $F = +2.4294892E+01$  SIGNIFICANCE OF F = SIGNIFICANT  
 $R = -1.4371410E-01$  SIGNIFICANCE OF R = SIGNIFICANT  
 $t = +4.9289849E+00$  SIGNIFICANCE OF t = SIGNIFICANT  
 $N = 1154$  DEGREES OF FREEDOM = 1152  
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = AMB TEMP/RH



WING 6.H.R. TRIAXIAL TENSILE, STRAIN AT MAX STRESS, CHS=1750 IN/MIN, 800 PSI

Figure 16

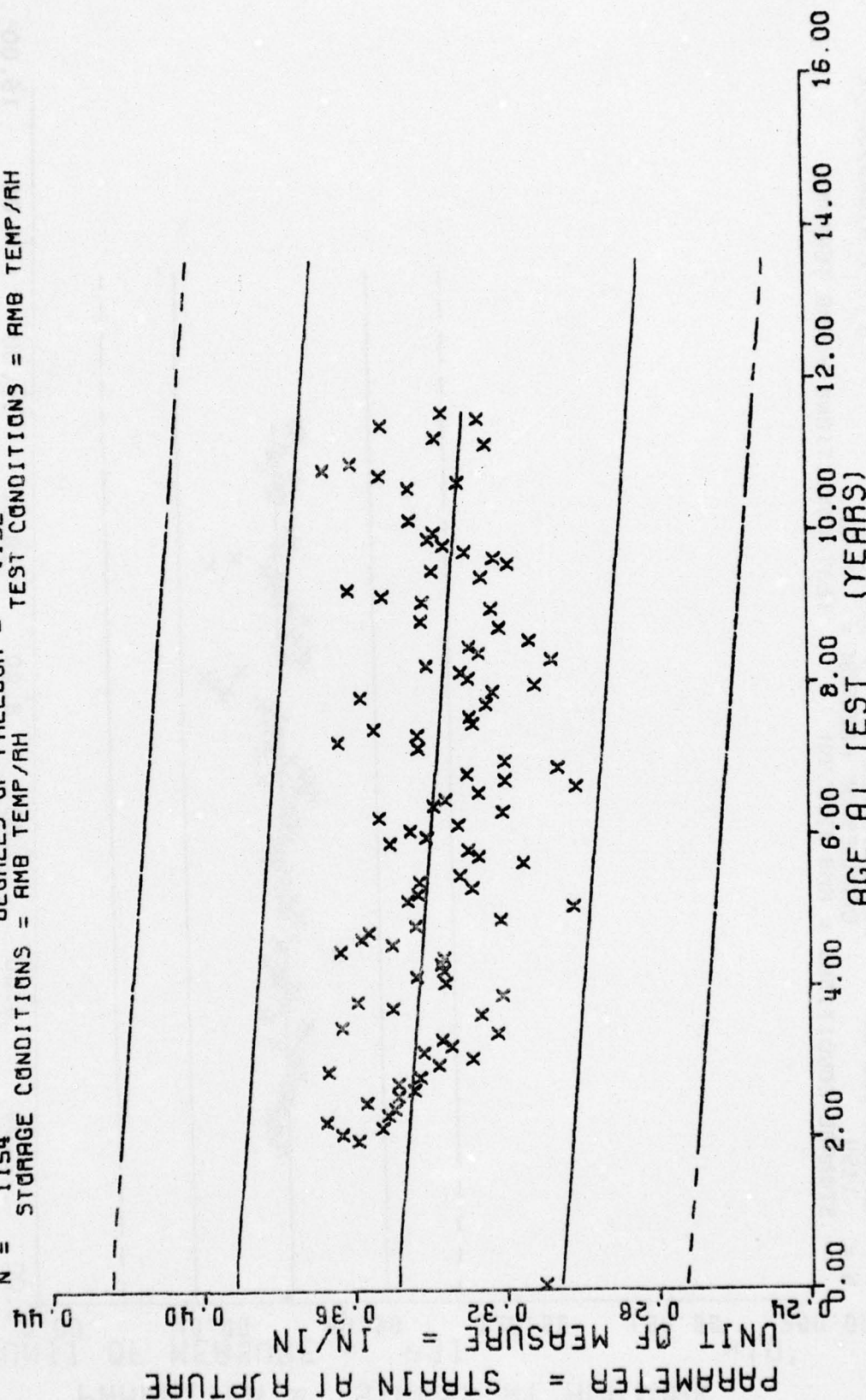
$Y = ((+6.7375622E+02) + (-2.1841198E-01) \times X)$   
 $r = +9.4663307E+00$  SIGNIFICANCE OF F = SIGNIFICANT  $C_1 = +8.2018550E+01$   
 $R = -9.0877355E-02$  SIGNIFICANCE OF R = SIGNIFICANT  $S_1 = +7.0980614E-02$   
 $t = +3.0770652E+00$  SIGNIFICANCE OF t = SIGNIFICANT  $S_2 = +8.1715076E+01$   
 $N = 1139$  DEGREES OF FREEDOM = 1137  
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = AMB TEMP/RH



WING 6.H.A.TRIAXIAL TENSILE, MAXIMUM STRESS, CHS=1750 IN/MIN, 800 PSI

Figure 17

$\gamma = (1 + 3.4954534e-01) + (-1.3874904e-04) \times X$   
 $F = +4.0115605e+01$  SIGNIFICANCE OF  $r =$  SIGNIFICANT  $G_1 = +2.5096236e-02$   
 $R = -1.8944189e-01$  SIGNIFICANCE OF  $R =$  SIGNIFICANT  $S_1 = +2.1906461e-05$   
 $L = +6.3337039e+00$  SIGNIFICANCE OF  $L =$  SIGNIFICANT  $S_2 = +2.5271149e-02$   
 $N = 1154$  DEGREES OF FREEDOM = 1152  
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = AMB TEMP/RH



WING 6.H.A.TRIAXIAL TENSILE, STRAIN AT RUPTURE, CHS=1750 IN/MIN, 800 PSI

Figure 18

$Y = ( (+6.7093606E+02) + (-9.1506180E-01) \times X )$   
 $F = +6.0392819E+00$  SIGNIFICANCE OF F = SIGNIFICANT  $G_1 = +1.4829195E+02$   
 $R = -7.2179902E-02$  SIGNIFICANCE OF R = SIGNIFICANT  $G_2 = +1.2826818E-01$   
 $t = +2.4562740E+00$  SIGNIFICANCE OF t = SIGNIFICANT  $G_3 = +1.4796939E+02$   
 $N = 1154$  DEGREES OF FREEDOM = 1152  
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = AMB TEMP/RH

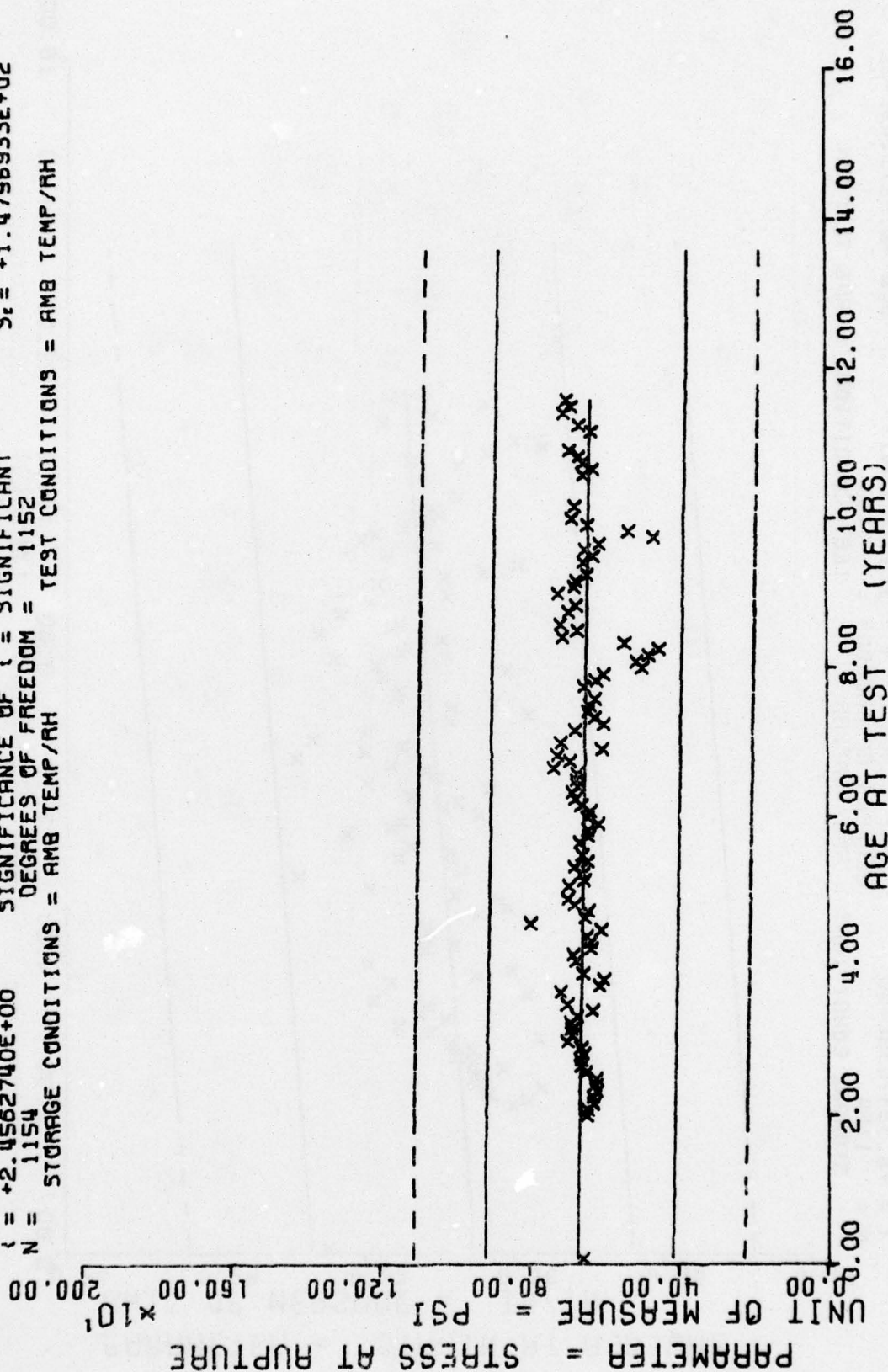
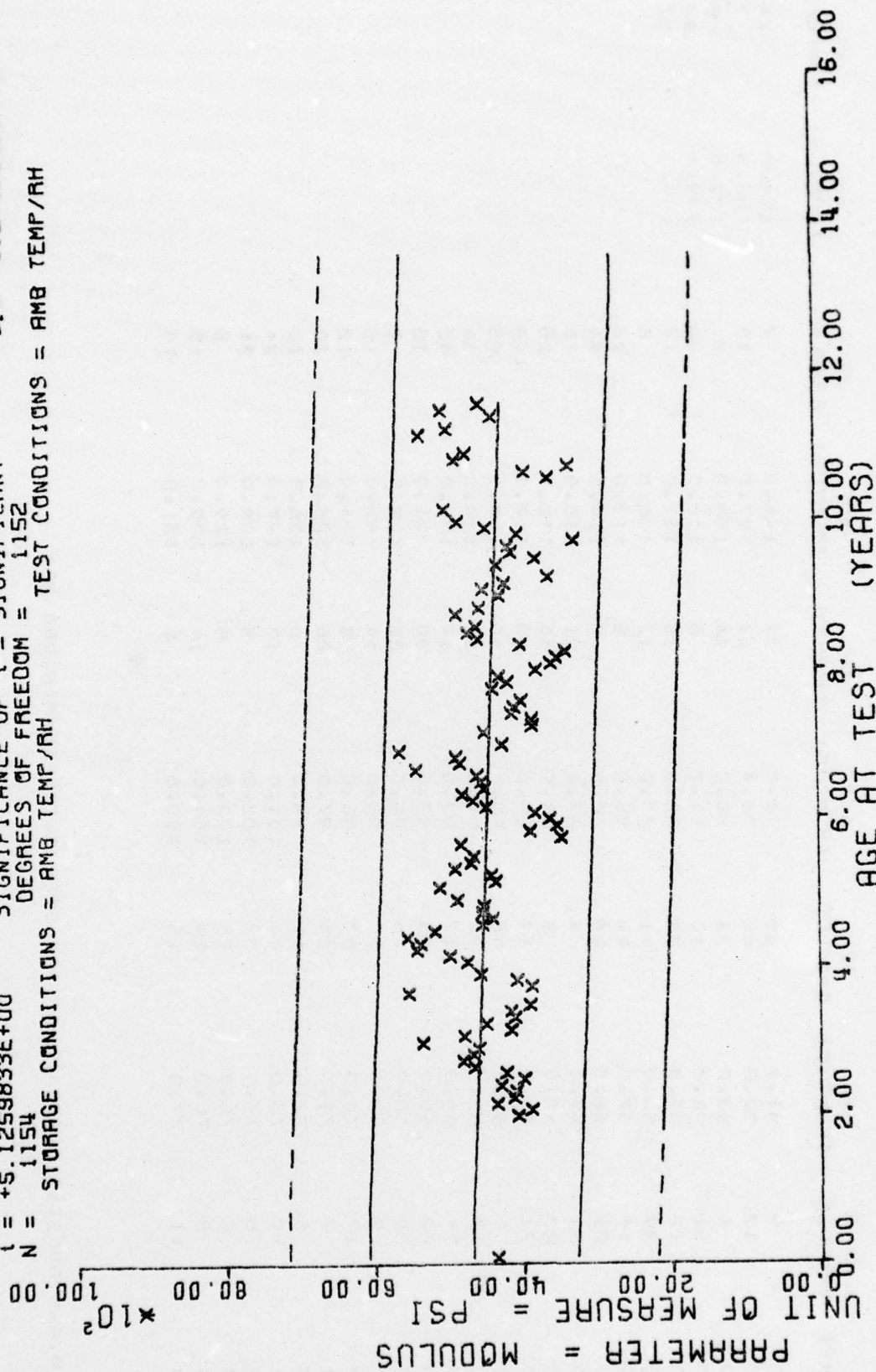


Figure 19

$Y = (1 + 4.7090691E+03) + (-3.6754812E+00) \times X$   
 $F = +2.6275705E+01$  SIGNIFICANCE OF F = SIGNIFICANT  
 $R = -1.4933229E-01$  SIGNIFICANCE OF R = SIGNIFICANT  
 $t = +5.1259833E+00$  SIGNIFICANCE OF t = SIGNIFICANT  
 $N = 1154$  DEGREES OF FREEDOM = 1152  
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = AMB TEMP/RH



WING 6.H.R. TRIAXIAL TENSILE, MODULUS, CHS=1750 IN/MIN AT 800 PSI

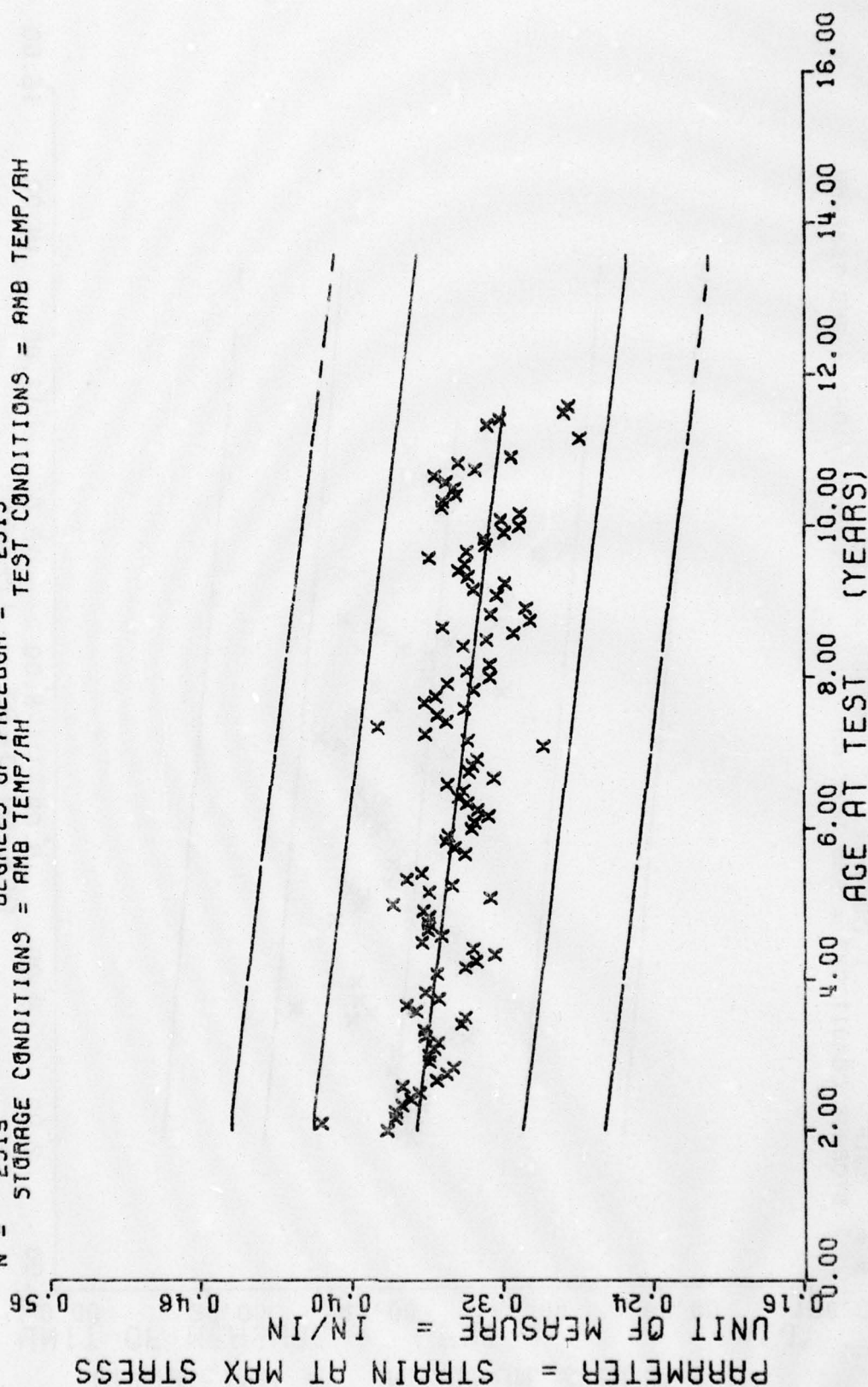
- 38 -

AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES
24.0	9	51.0	35	78.0	27	106.0	7	134.0	24
25.0	12	52.0	65	79.0	61	107.0	10	135.0	3
26.0	6	53.0	34	80.0	14	109.0	21	137.0	6
27.0	21	54.0	10	81.0	6	110.0	36	138.0	43
28.0	12	55.0	37	82.0	18	111.0	12	139.0	57
29.0	29	56.0	41	83.0	13	112.0	6		
30.0	18	57.0	48	85.0	5	113.0	75		
31.0	21	58.0	40	86.0	5	114.0	41		
32.0	31	59.0	4	87.0	21	115.0	15		
33.0	23	60.0	8	88.0	15	116.0	25		
34.0	21	61.0	17	89.0	40	117.0	109		
35.0	5	62.0	40	90.0	40	118.0	25		
36.0	17	63.0	84	91.0	15	119.0	34		
37.0	24	64.0	17	92.0	14	120.0	42		
38.0	22	65.0	25	93.0	20	121.0	15		
39.0	20	68.0	16	94.0	22	122.0	2		
40.0	9	69.0	27	95.0	14	123.0	15		
41.0	17	70.0	27	96.0	5	124.0	12		
42.0	7	71.0	24	97.0	26	125.0	30		
43.0	5	72.0	11	98.0	5	126.0	12		
44.0	10	73.0	44	101.0	17	127.0	24		
45.0	5	74.0	38	102.0	5	128.0	21		
46.0	5	75.0	28	103.0	5	129.0	6		
49.0	8	76.0	19	104.0	14	130.0	15		
50.0	11	77.0	15	105.0	5	131.0	18		

WING 6.H.R.HYDROSTATIC,STRAIN AT MAX STRESS,1750 IN/MIN,800 PSI

This sample size summary is applicable to figures 21 thru 25

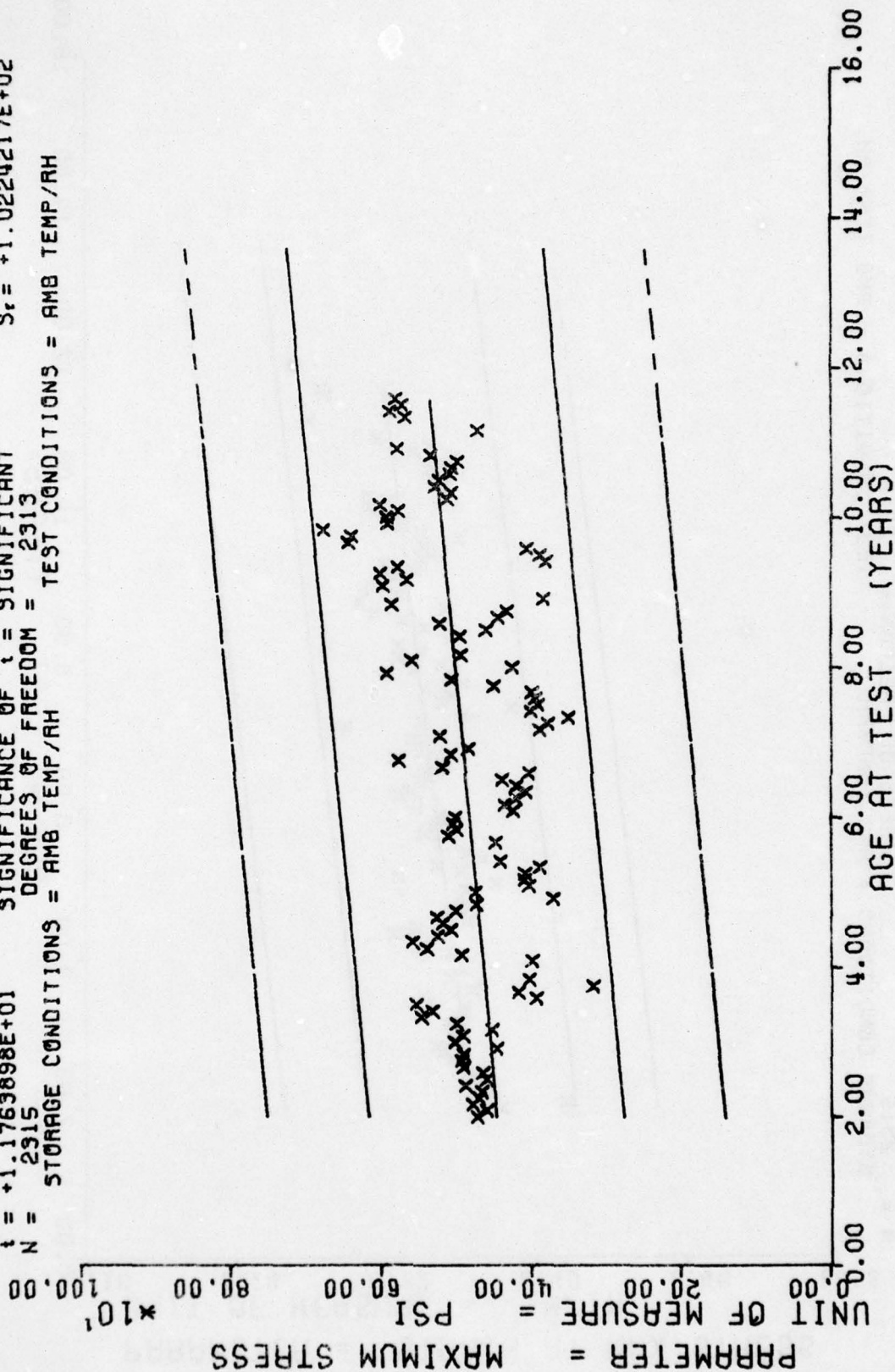
$F = +3.6701728E+02$   
 $R = -3.7006197E-01$   
 $t = +1.9157695E+01$   
 $N = 2315$   
 STORAGE CONDITIONS = AMB TEMP/RH  
 DEGREES OF FREEDOM = 2313  
 $Y = ((+3.7564675E-01) + (-4.0292517E-04) \times X)$   
 SIGNIFICANCE OF F = SIGNIFICANT  
 SIGNIFICANCE OF R = SIGNIFICANT  
 SIGNIFICANCE OF t = SIGNIFICANT  
 $S_1 = +3.5537255E-02$   
 $S_2 = +2.1032027E-05$   
 $S_3 = +3.3021497E-02$



WING 6.H.R. HYDROSTATIC STRAIN AT MAX STRESS, 1750 IN/MIN, 800 PSI

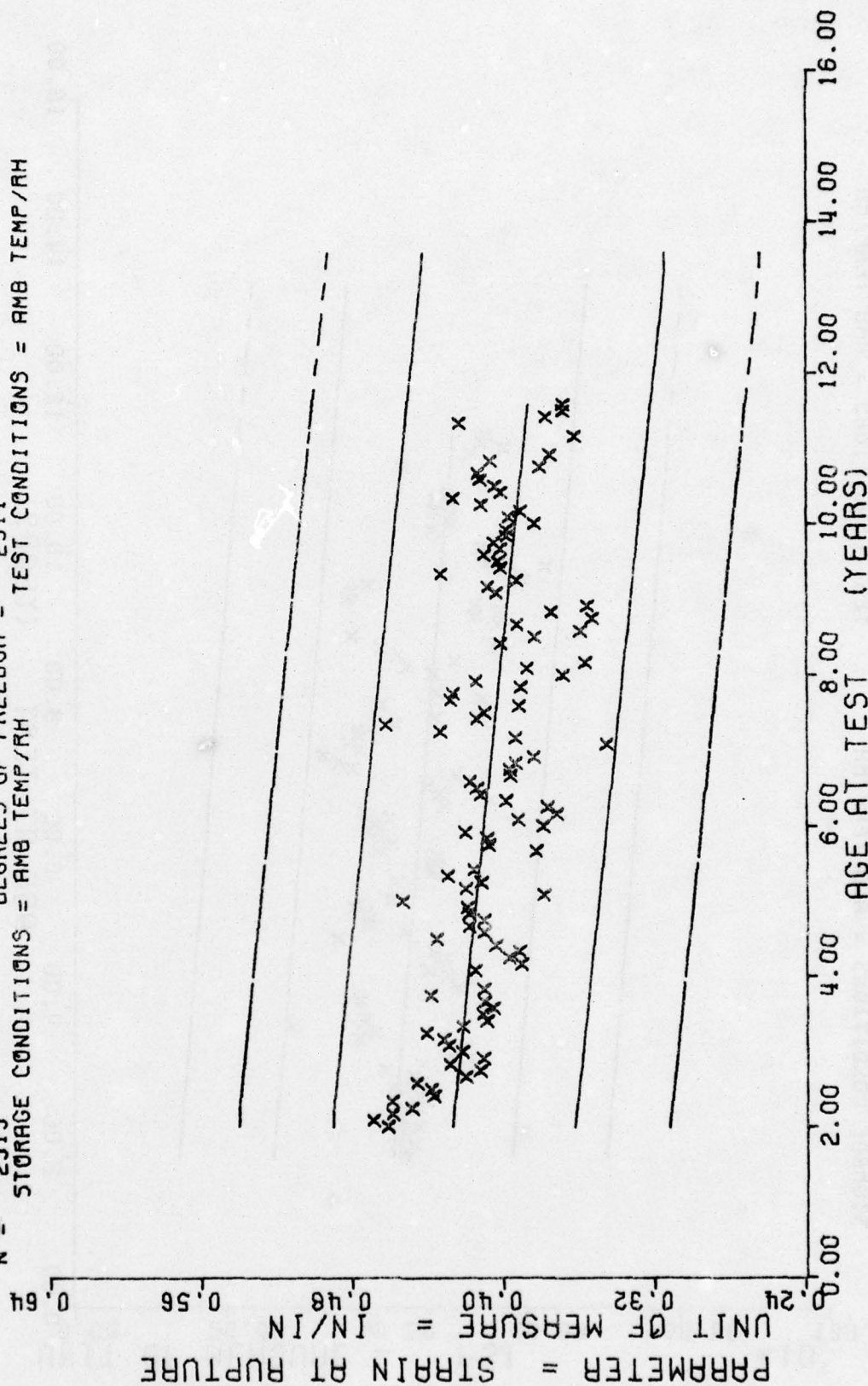
Figure 21

$Y = ((+4.2903682E+02) + (+7.6606522E-01) * X)$   
 $F = +1.9898990E+02$  SIGNIFICANCE OF F = SIGNIFICANT  $G_1 = +1.0523363E+02$   
 $R = +2.9759928E-01$  SIGNIFICANCE OF R = SIGNIFICANT  $S_0 = +6.5120013E-02$   
 $t = +1.1763898E+01$  SIGNIFICANCE OF t = SIGNIFICANT  $S_1 = +1.0224217E+02$   
 $N = 2315$  DEGREES OF FREEDOM = 2313  
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = AMB TEMP/RH



WING 6,H.R.HYDROSTATIC,MAXIMUM STRESS,1750IN/MIN,800 PSI

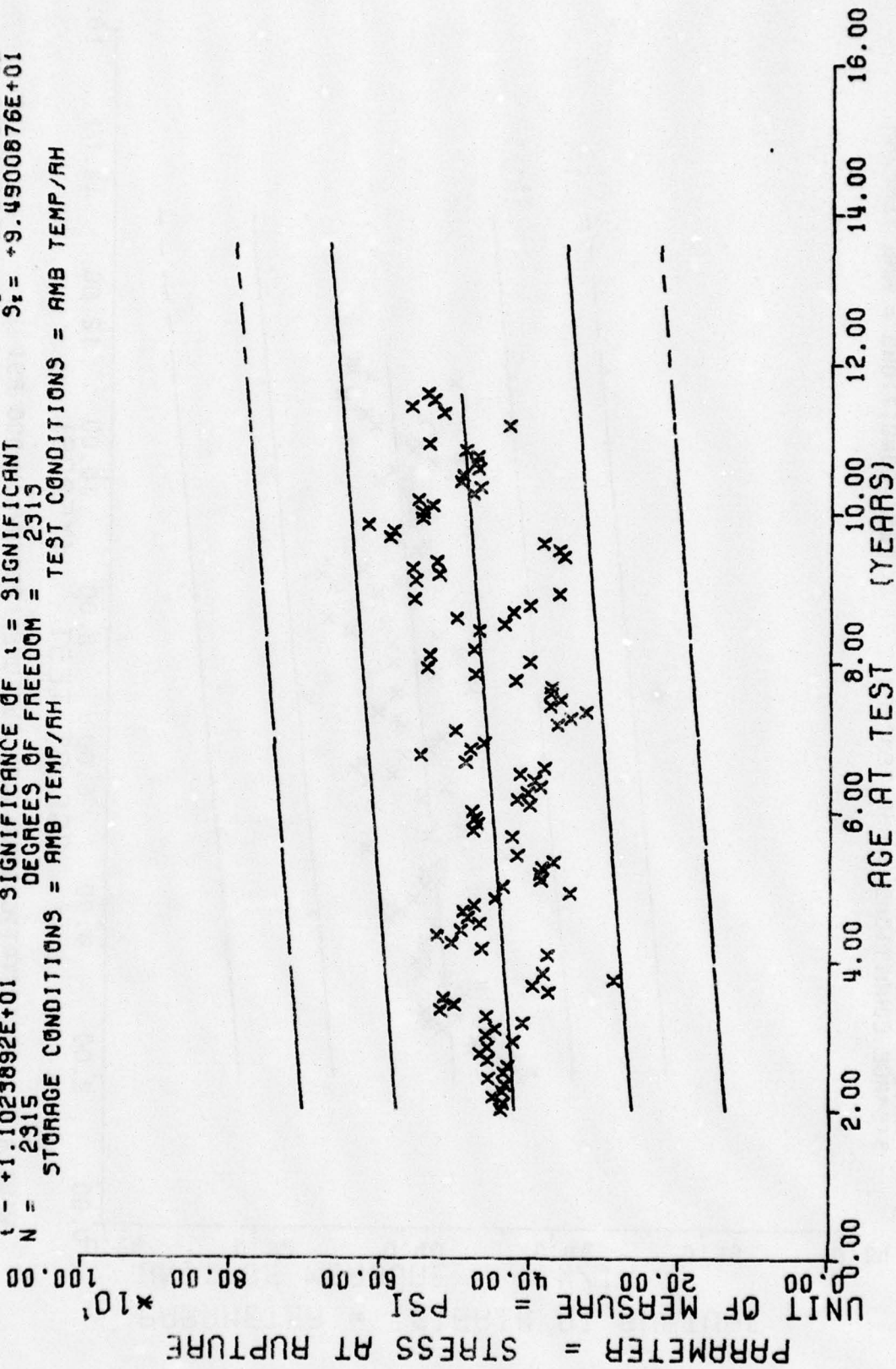
$Y = ((+4.3541829E-01) + (-3.5200847E-04) * X)$   
 $F = +2.1127817E+02$  SIGNIFICANCE OF F = SIGNIFICANT  $G_1 = +3.9676427E-02$   
 $R = -2.8942152E-01$  SIGNIFICANCE OF R = SIGNIFICANT  $S_1 = +2.4217304E-05$   
 $t = +1.4535411E+01$  SIGNIFICANCE OF t = SIGNIFICANT  $S_2 = +3.7986561E-02$   
 $N = 2313$  DEGREES OF FREEDOM = 2311  
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = AMB TEMP/RH



WING 6.H.R. HYDROSTATIC, STRAIN AT RUPTURE, 1750 IN/MIN, 800 PSI

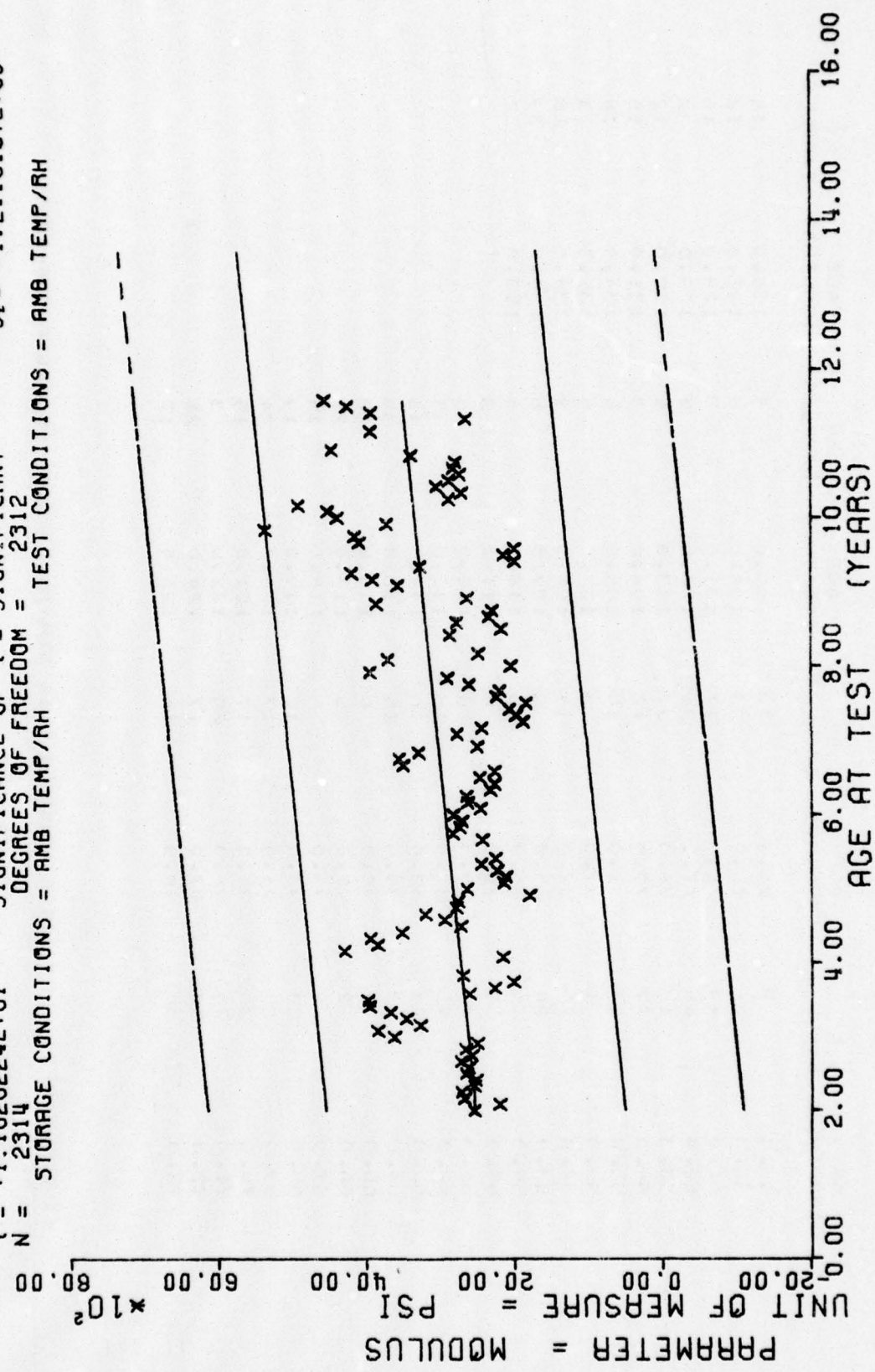
Figure 23

$Y = (1 + 4.0617896E+02) + ( +6.6639032E-01 ) * X$   
 $F = +1.2152620E+02$  SIGNIFICANCE OF F = SIGNIFICANT  $G_1 = +9.7340393E+01$   
 $R = +2.2342293E-01$  SIGNIFICANCE OF R = SIGNIFICANT  $S_1 = +5.0444196E-02$   
 $t = +1.1023892E+01$  SIGNIFICANCE OF t = SIGNIFICANT  $S_2 = +9.4900876E+01$   
 $N = 2915$  DEGREES OF FREEDOM = 2313  
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = AMB TEMP/RH



WING 6,H.A.HYDROSTATIC,STRESS AT RUPTURE,1750IN/MIN,800 PSI

$Y = (1 + 2.3351106E+03) + ( + 8.5009286E+00 ) * X$   
 $F = +1.2144535E+02$  SIGNIFICANCE OF F = SIGNIFICANT  $G_1 = +1.2421504E+03$   
 $R = +2.239819E-01$  SIGNIFICANCE OF R = SIGNIFICANT  $S_1 = +7.7139340E-01$   
 $t = +1.1020224E+01$  SIGNIFICANCE OF t = SIGNIFICANT  $S_2 = +1.2110197E+03$   
 $N = 2314$  DEGREES OF FREEDOM = 2312  
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = AMB TEMP/RH



WING 6.H.R.HYDROSTATIC.MODULUS,1750 IN/MIN, 800 PSI

Figure 25

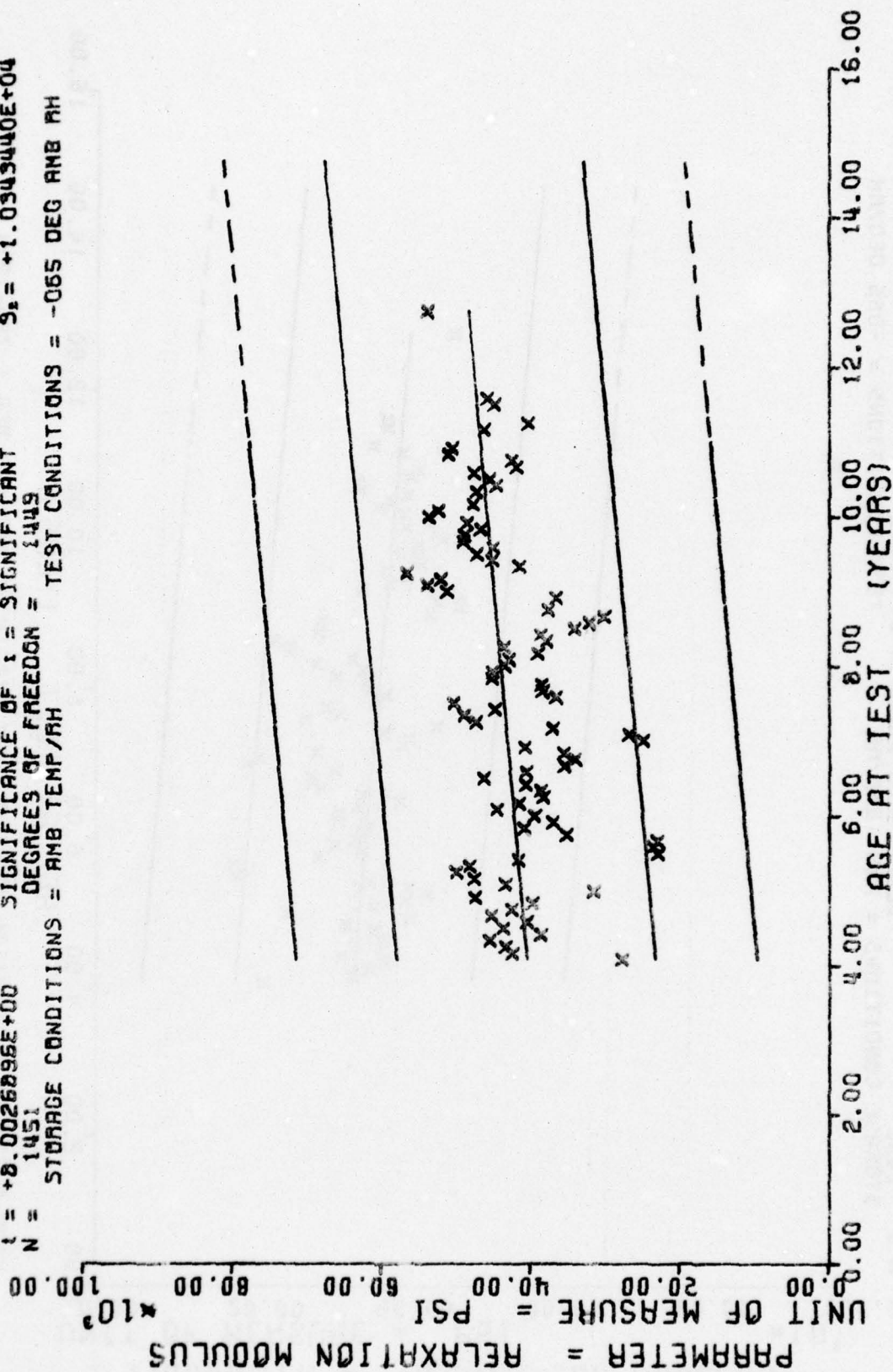
\*\*\* SAMPLE SIZE SUMMARY \*\*\*

AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES
49.0	2	74.0	29	69.0	8	126.0	19
50.0	26	75.0	23	100.0	6	127.0	12
51.0	44	76.0	17	101.0	9	128.0	15
52.0	46	77.0	34	102.0	5	129.0	2
53.0	18	78.0	22	103.0	6	130.0	12
54.0	27	79.0	12	104.0	3	131.0	15
55.0	27	80.0	14	105.0	6	134.0	16
56.0	21	81.0	8	107.0	6	135.0	3
57.0	24	82.0	14	108.0	9	138.0	28
58.0	20	83.0	9	109.0	6	139.0	39
59.0	9	84.0	5	110.0	6	153.0	32
60.0	9	85.0	6	111.0	3		
61.0	21	86.0	3	112.0	9		
62.0	46	87.0	18	113.0	45		
63.0	23	88.0	16	114.0	15		
64.0	27	89.0	15	115.0	30		
65.0	9	90.0	6	116.0	22		
66.0	2	91.0	5	117.0	21		
67.0	9	92.0	6	118.0	15		
68.0	3	93.0	16	119.0	19		
69.0	20	94.0	17	120.0	24		
70.0	30	95.0	17	121.0	15		
71.0	38	96.0	20	122.0	3		
72.0	30	97.0	17	124.0	21		
73.0	30	98.0	16	125.0	17		

WING G. STRESS RELAXATION MODULUS 0.5% STRAIN, 10 SEC. - 5 DEG F, TPH-1011

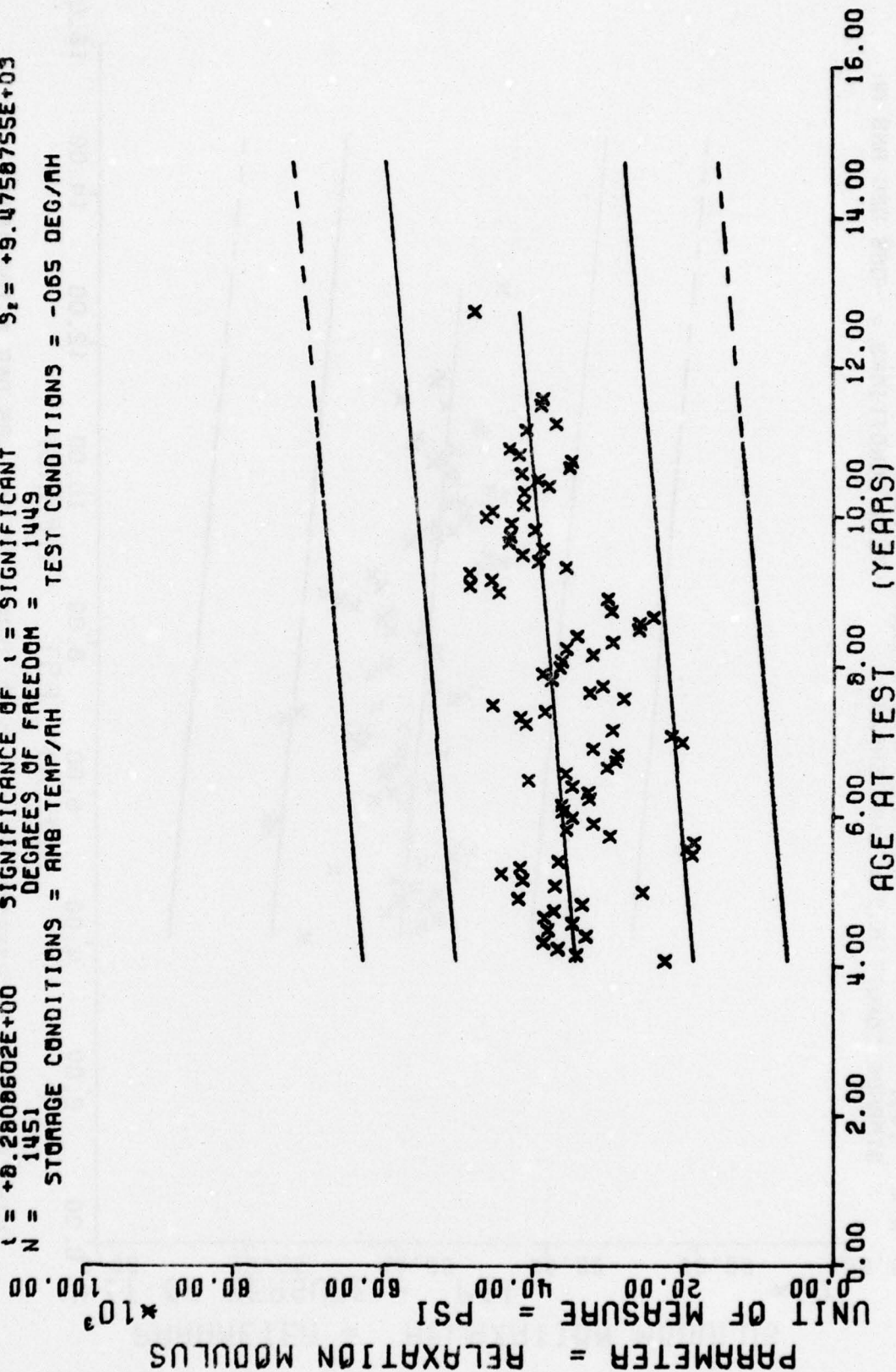
This sample size summary is applicable to figures 26 thru 29

$\gamma = (1 + 5.6890205E+04) + (+7.5625181E+01) \times X$   
 $F = +6.4043041E+01$  SIGNIFICANCE OF F = SIGNIFICANT  
 $R = +2.0573601E-01$  SIGNIFICANCE OF R = SIGNIFICANT  
 $t = +8.0026895E+00$  SIGNIFICANCE OF t = SIGNIFICANT  
 $N = 1451$  DEGREES OF FREEDOM = 1449  
 STORAGE CONDITIONS = AMB TEMP/AM TEST CONDITIONS = -065 DEG AMB RH



WING 6. STRESS RELAXATION MODULUS, 0.5% STRAIN, 10 SEC. -65 DEG F. TPH-1011

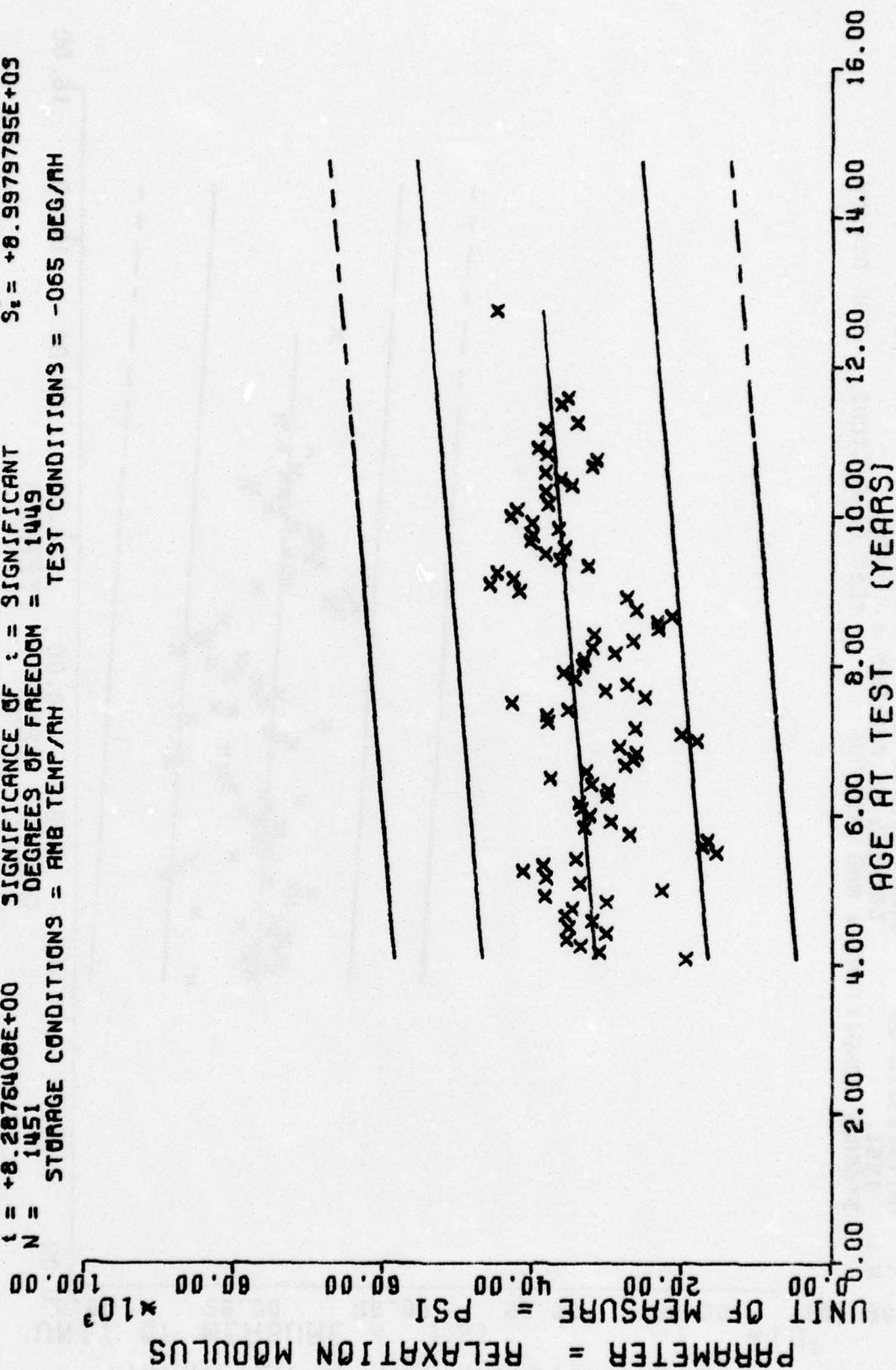
$Y = ((+3.0917454E+04) + (+7.1690272E+01) * X)$   
 $F = +6.8572646E+01$  SIGNIFICANCE OF F = SIGNIFICANT  
 $R = +2.1256938E-01$  SIGNIFICANCE OF R = SIGNIFICANT  
 $t = +0.2808602E+00$  SIGNIFICANCE OF t = SIGNIFICANT  
 $N = 1451$  DEGREES OF FREEDOM = 1449  
 STORAGE CONDITIONS = AMB TEMP/AH TEST CONDITIONS = -065 DEG/AH



WING 6. STRESS RELAXATION MODULUS, 0.5% STRAIN, 50 SEC., -65 DEG F, TPH-1011

Figure 27

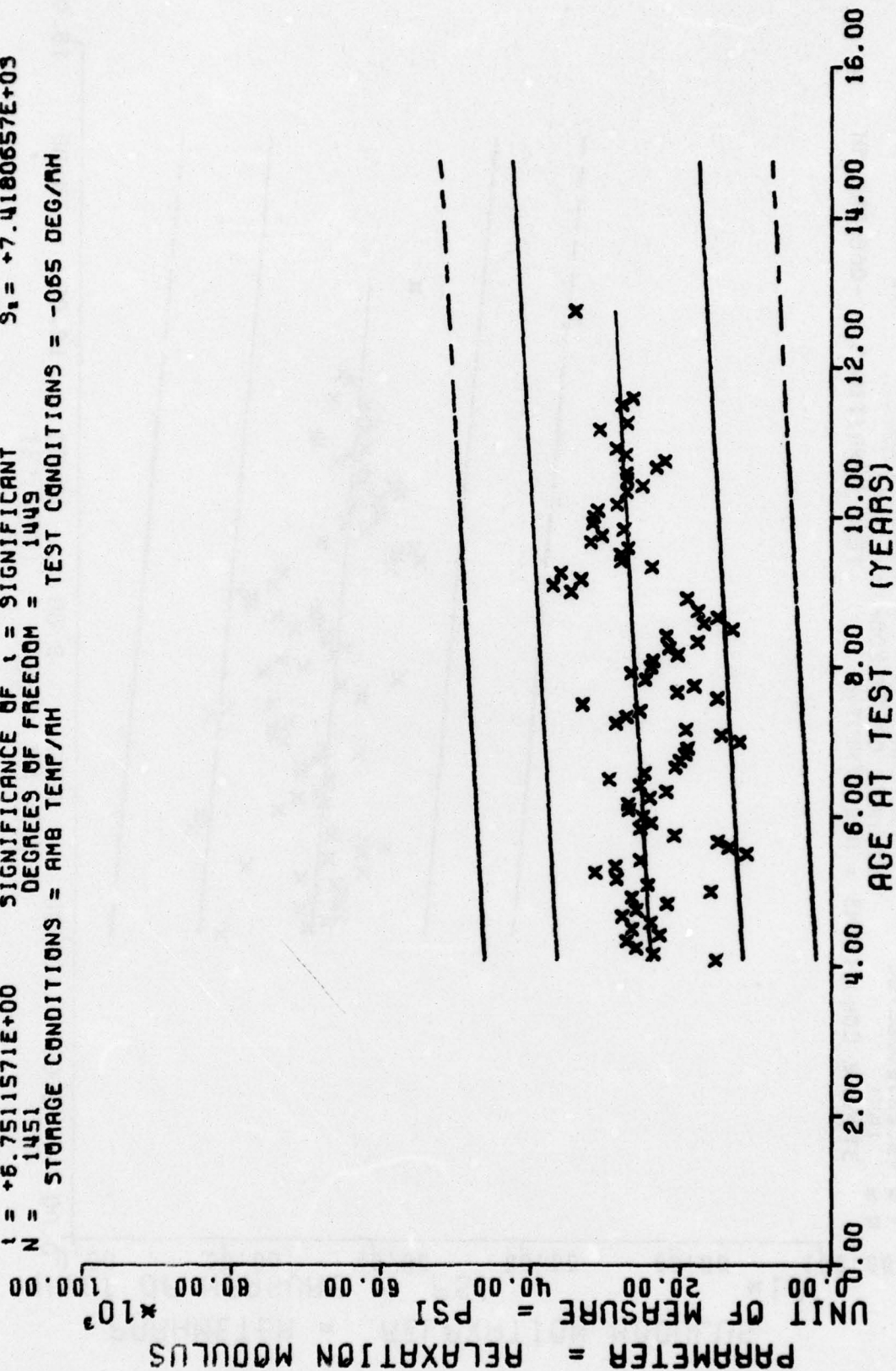
$F = +6.8684991E+01$  SIGNIFICANCE OF  $F = +6.8190465E+01$  \* X  
 $R = +2.1273556E-01$  SIGNIFICANCE OF  $R =$  SIGNIFICANT  
 $t = +8.2876400E+00$  SIGNIFICANCE OF  $t =$  SIGNIFICANT  
 $N = 1451$  DEGREES OF FREEDOM = 1449  
 STORAGE CONDITIONS = AMB TEMP/AM TEST CONDITIONS = -065 DEG/AM



WING 6. STRESS RELAXATION MODULUS, 0.5% STRAIN, 100 SEC. -65 DEG F, TPN-1011

Figure 28

$Y = ((+2.1972902E+04) + (+4.5754553E+01) \times X)$   
 $F = +4.5578123E+01$  SIGNIFICANCE OF F = SIGNIFICANT  $G = +7.5312313E+03$   
 $R = +1.7463002E-01$  SIGNIFICANCE OF R = SIGNIFICANT  $S_1 = +6.7772905E+00$   
 $t = +6.7511571E+00$  SIGNIFICANCE OF t = SIGNIFICANT  $S_2 = +7.4180657E+03$   
 $N = 1451$  DEGREES OF FREEDOM = 1449  
 STORAGE CONDITIONS = AMB TEMP/MH TEST CONDITIONS = -065 DEG/MH



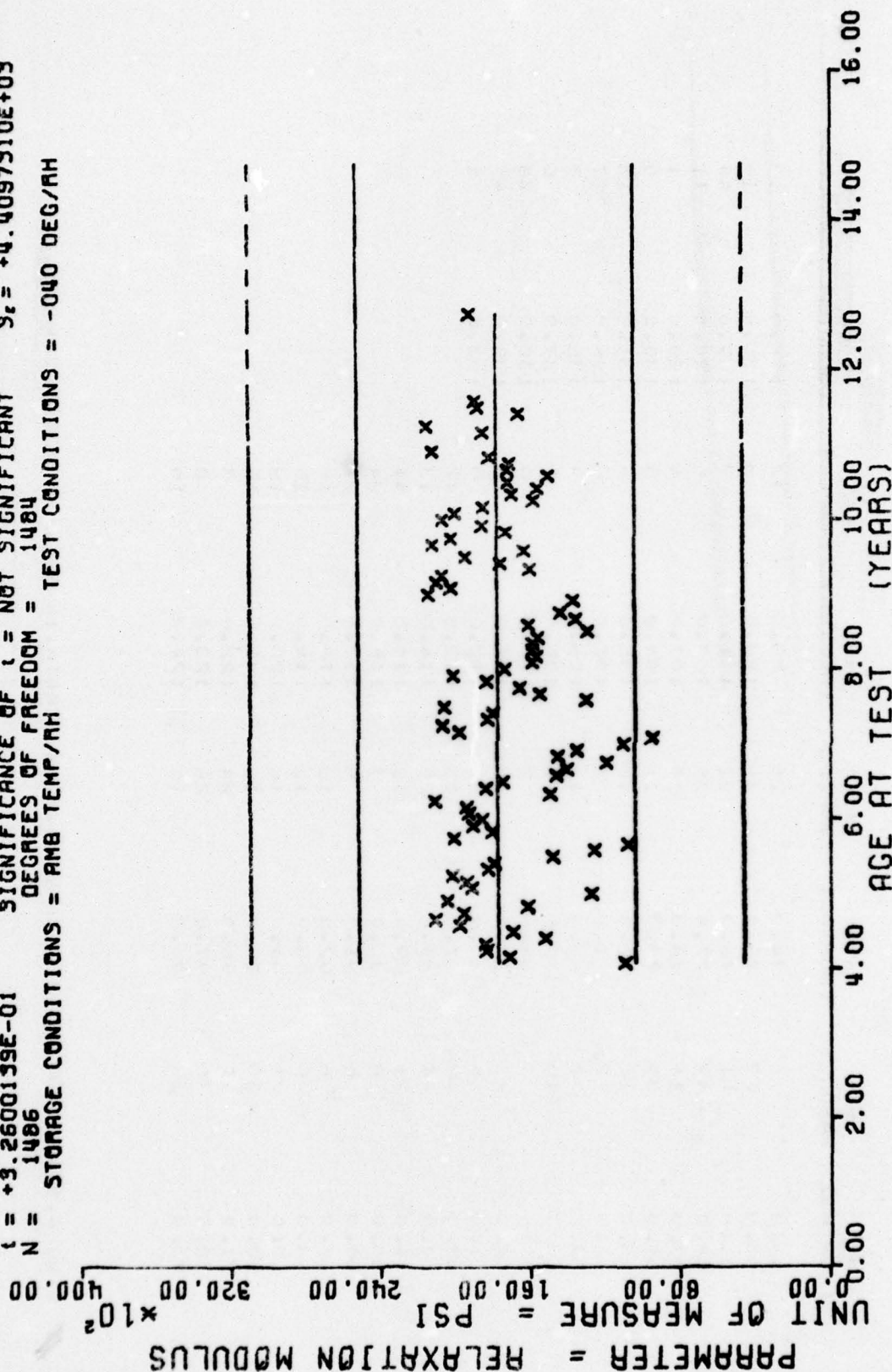
\*\*\* SAMPLE SIZE SUMMARY \*\*\*

AGE (MONTHS)	NP SAMPLES	AGE (MONTHS)	NP SAMPLES	AGE (MONTHS)	NP SAMPLES	AGE (MONTHS)	NP SAMPLES
44.0	1	74.0	25	99.0	12	125.0	13
50.0	27	75.0	18	100.0	3	126.0	10
51.0	51	76.0	26	101.0	0	127.0	44
52.0	47	77.0	30	102.0	6	128.0	11
53.0	14	78.0	29	103.0	5	129.0	1
54.0	30	79.0	12	104.0	3	130.0	9
55.0	18	80.0	17	105.0	6	131.0	13
56.0	12	81.0	6	107.0	6	134.0	27
57.0	27	82.0	11	108.0	3	135.0	3
58.0	19	83.0	6	109.0	6	137.0	6
59.0	6	84.0	9	110.0	6	138.0	38
60.0	12	85.0	3	111.0	3	139.0	45
61.0	20	86.0	6	112.0	0	153.0	6
62.0	48	87.0	15	113.0	47		
63.0	24	88.0	20	114.0	13		
64.0	21	89.0	12	115.0	41		
65.0	9	90.0	5	116.0	24		
66.0	6	91.0	6	117.0	21		
67.0	6	92.0	12	118.0	15		
68.0	6	93.0	12	119.0	15		
69.0	21	94.0	16	120.0	18		
70.0	30	95.0	15	121.0	15		
71.0	41	96.0	24	122.0	3		
72.0	36	97.0	20	123.0	2		
73.0	23	98.0	18	124.0	10		

WING 6, STRESS RELAXATION MODULUS, 0.5% STRAIN, 10 SEC, -40 DEG F, TPIH-1011

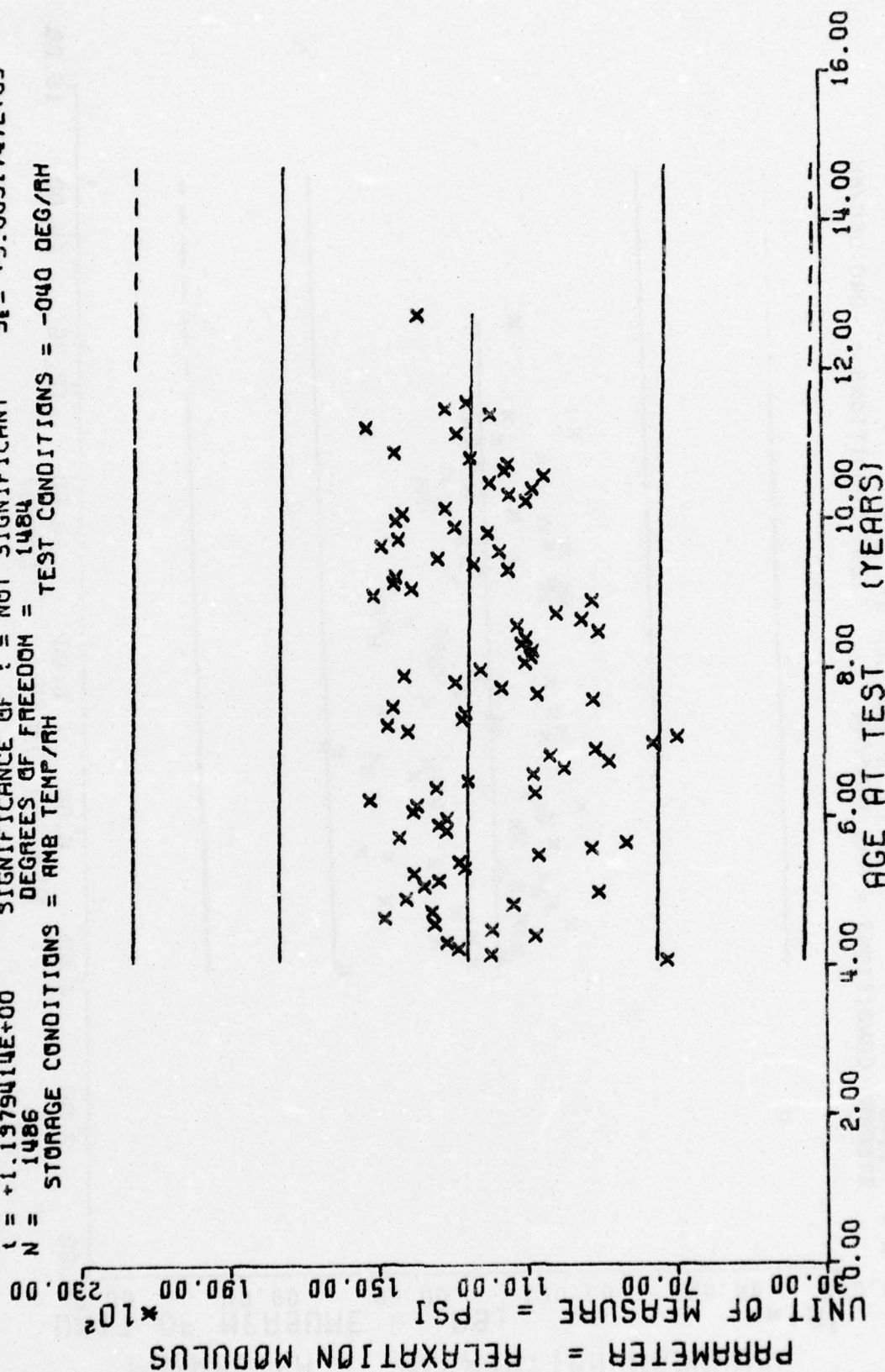
This sample size summary is applicable to figures 30 thru 33

$Y = ((+1.7729728E+04) + (+1.3265603E+00) \times X)$   
 F = +1.0627691E-01 SIGNIFICANCE OF F = NOT SIGNIFICANT  $G_1 = +4.4084039E+03$   
 R = +8.4622716E-03 SIGNIFICANCE OF R = NOT SIGNIFICANT  $S_1 = +4.0691862E+00$   
 t = +3.2600139E-01 SIGNIFICANCE OF t = NOT SIGNIFICANT  $S_2 = +4.4097310E+03$   
 N = 1486 DEGREES OF FREEDOM = 1484  
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = -040 DEG/RH



WING 6 STRESS RELAXATION MODULUS, 0.5% STRAIN, 10 SEC, -40 DEG F, TPH-1011

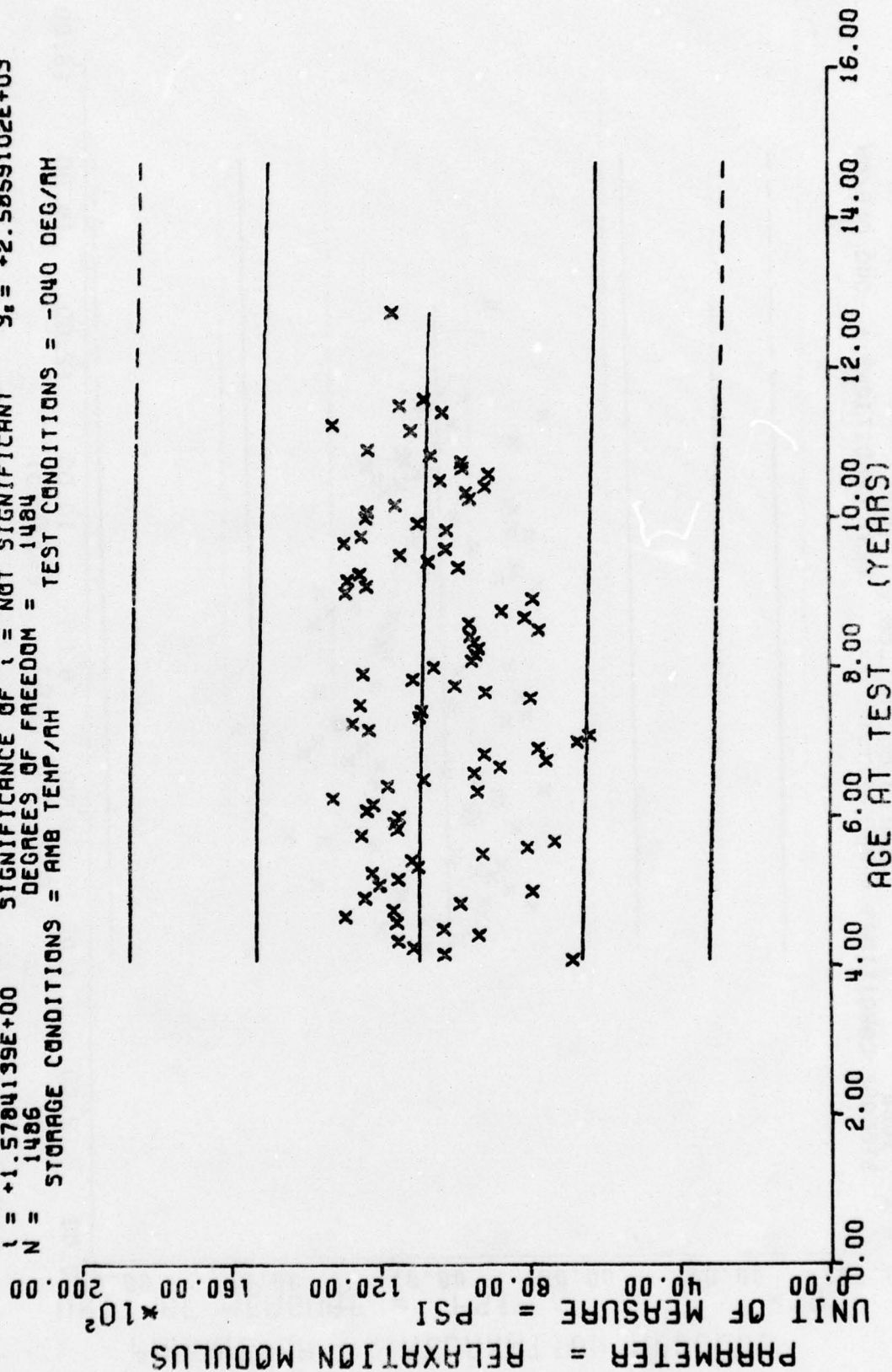
$\gamma = ((+1.2782201E+04) + (-3.1556229E+00) \times X)$   
 $F = +1.2949107E+00$  SIGNIFICANCE OF F = NOT SIGNIFICANT  $G_1 = +3.0054731E+03$   
 $R = -2.9526608E-02$  SIGNIFICANCE OF R = NOT SIGNIFICANT  $S_1 = +2.7790978E+00$   
 $t = +1.1979414E+00$  SIGNIFICANCE OF t = NOT SIGNIFICANT  $S_2 = +3.0051747E+03$   
 $N = 1486$  DEGREES OF FREEDOM = 1484  
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = -040 DEG/RH



WING 6. STRESS RELAXATION MODULUS, 0.5% STRAIN, 50 SEC., -40 DEG F, TPH-1011

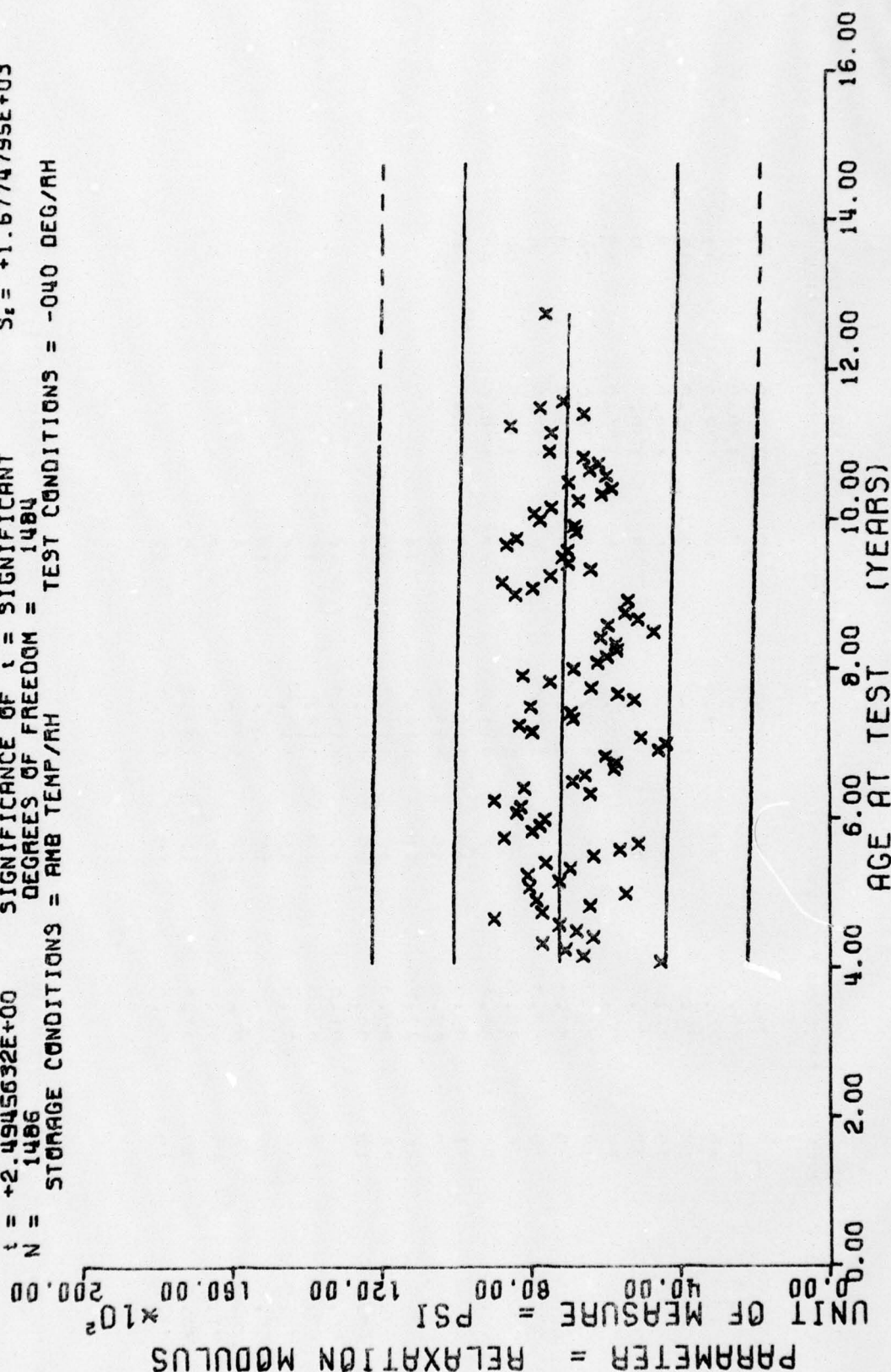
Figure 31

$Y = ((+1.1206696E+04) + (-3.7664293E+00) * X)$   
 SIGNIFICANCE OF F = NOT SIGNIFICANT  $G_1 = +2.5872084E+03$   
 SIGNIFICANCE OF R = NOT SIGNIFICANT  $G_2 = +2.5862113E+00$   
 SIGNIFICANCE OF I = NOT SIGNIFICANT  $G_3 = +2.5859102E+03$   
 DEGREES OF FREEDOM = 1484  
 STORAGE CONDITIONS = AMB TEMP/AM TEST CONDITIONS = -040 DEG/AM



WING 6. STRESS RELAXATION MODULUS, 0.5% STRAIN, 100 SEC, -40 DEG F, TPH-1011

$\gamma = ((+7.4510030E+03) + (-3.8614215E+00) \times X)$   
 $F = +6.2228457E+00$  SIGNIFICANCE OF F = SIGNIFICANT  $G_1 = +1.6804268E+03$   
 $R = -6.4620290E-02$  SIGNIFICANCE OF R = SIGNIFICANT  $S_4 = +1.5479349E+00$   
 $t = +2.4945632E+00$  SIGNIFICANCE OF t = SIGNIFICANT  $S_2 = +1.6774795E+03$   
 $N = 1486$  DEGREES OF FREEDOM = 1484  
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = -040 DEG/RH



WING 6. STRESS RELAXATION MODULUS, 0.5% STRAIN, 1000 SEC, -40 DEG F, TPH-1011

Figure 33

\*\*\* SAMPLE SIZE SUMMARY \*\*\*

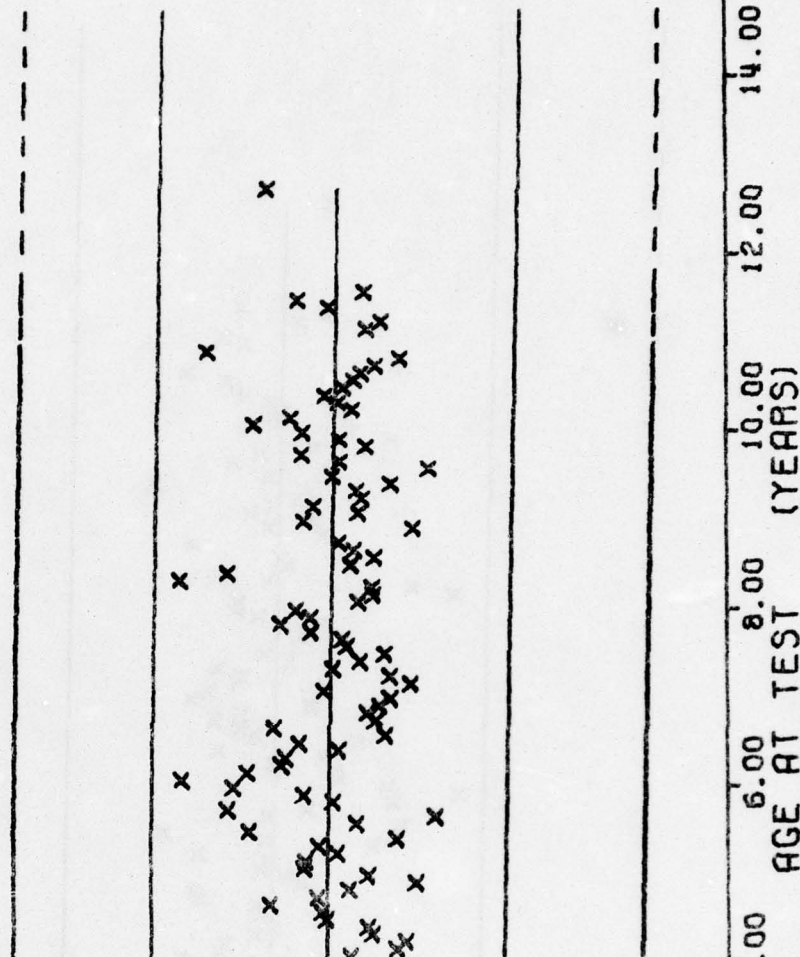
AGE (MONTHS)	NO. SAMPLES	AGE (MONTHS)	NO. SAMPLES	AGE (MONTHS)	NO. SAMPLES	AGE (MONTHS)	NO. SAMPLES
60.0	6	76.0	77	92.0	12	125.0	15
50.0	27	75.0	20	100.0	3	126.0	17
41.0	50	74.0	23	101.0	12	127.0	11
32.0	43	73.0	28	102.0	5	128.0	15
23.0	15	72.0	30	103.0	6	129.0	3
14.0	30	71.0	15	104.0	7	130.0	0
5.0	18	70.0	21	105.0	6	131.0	15
0.0	18	69.0	15	107.0	6	134.0	24
0.0	70	68.0	15	108.0	9	135.0	3
0.0	16	67.0	12	109.0	6	137.0	6
0.0	6	66.0	9	110.0	6	138.0	20
0.0	20	65.0	3	111.0	3	139.0	60
0.0	21	64.0	15	112.0	24	153.0	6
0.0	40	63.0	14	113.0	38		
0.0	24	62.0	21	114.0	14		
0.0	24	61.0	15	115.0	30		
0.0	12	60.0	15	116.0	77		
0.0	5	59.0	12	117.0	21		
0.0	7	58.0	12	118.0	15		
0.0	6	57.0	15	119.0	24		
0.0	20	56.0	15	120.0	18		
0.0	24	55.0	23	121.0	15		
0.0	43	54.0	24	122.0	7		
0.0	30	53.0	12	123.0	6		
0.0	10	52.0	18	124.0	17		

FIG. 6. STRESS RELAXATION MODULUS, 1.0% STRAIN, 10 SEC, 20 DEG F, TPN-1011

This sample size summary is applicable to figures 34 thru 37

$F = +2.6776174E+00$   
 $R = -4.1092902E-02$   
 $t = +1.6363427E+00$   
 $N = 1585$   
 $Y = ((+1.7240190E+03) + (-3.5480570E-01) * X)$   
 SIGNIFICANCE OF F = NOT SIGNIFICANT  
 SIGNIFICANCE OF R = NOT SIGNIFICANT  
 SIGNIFICANCE OF t = NOT SIGNIFICANT  
 DEGREES OF FREEDOM = 1583  
 STORAGE CONDITIONS = AMB TEMP/RH  
 TEST CONDITIONS = +020 DEG/RH

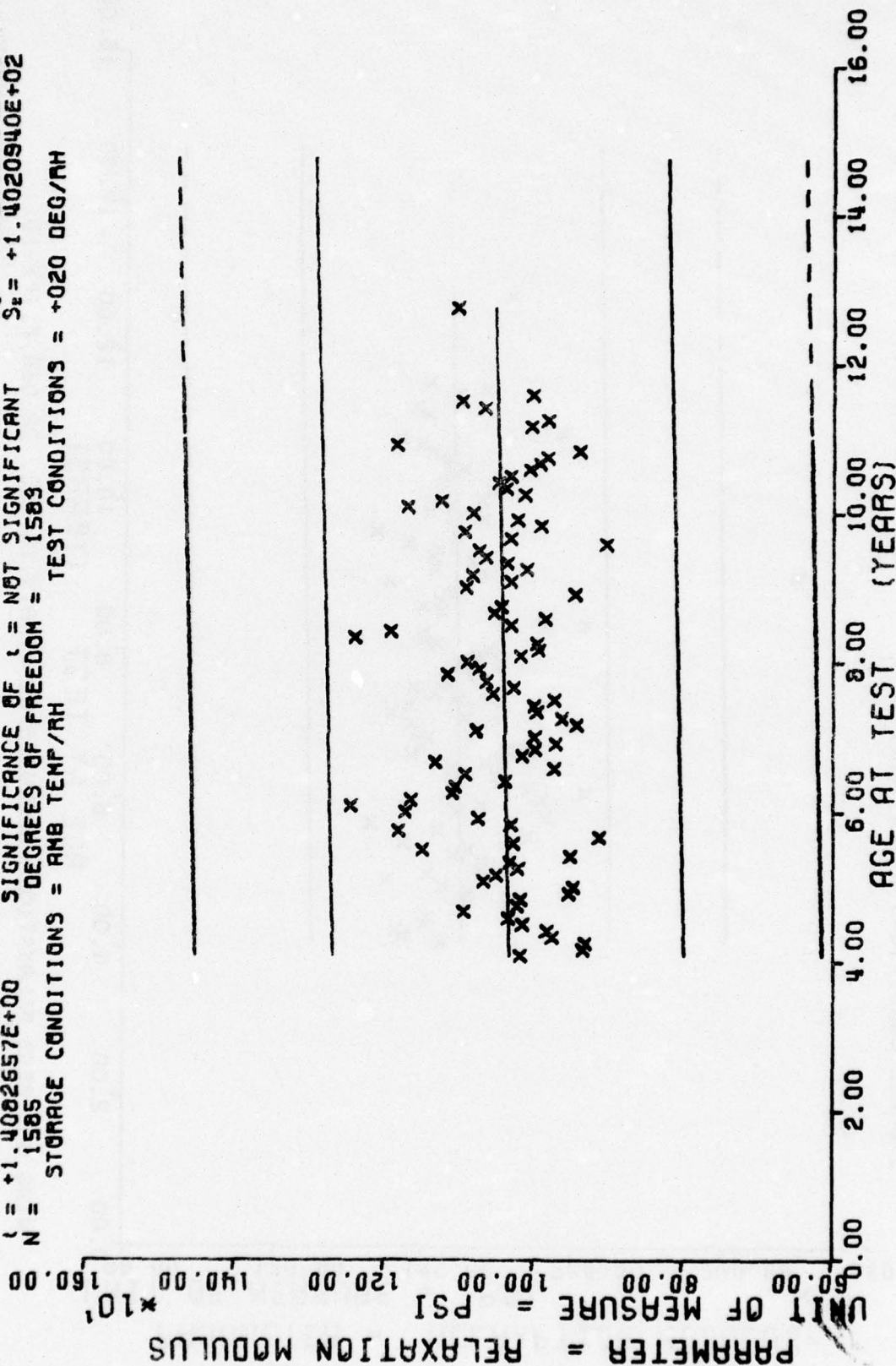
PARAMETER = RELAXATION MODULUS  
 UNIT OF MEASURE = PSI  
 \*10<sup>1</sup>



WING 6 STRESS RELAXATION MODULUS, 3.0% STRAIN, 10 SEC, 20 DEG F, TPH-1011

Figure 34

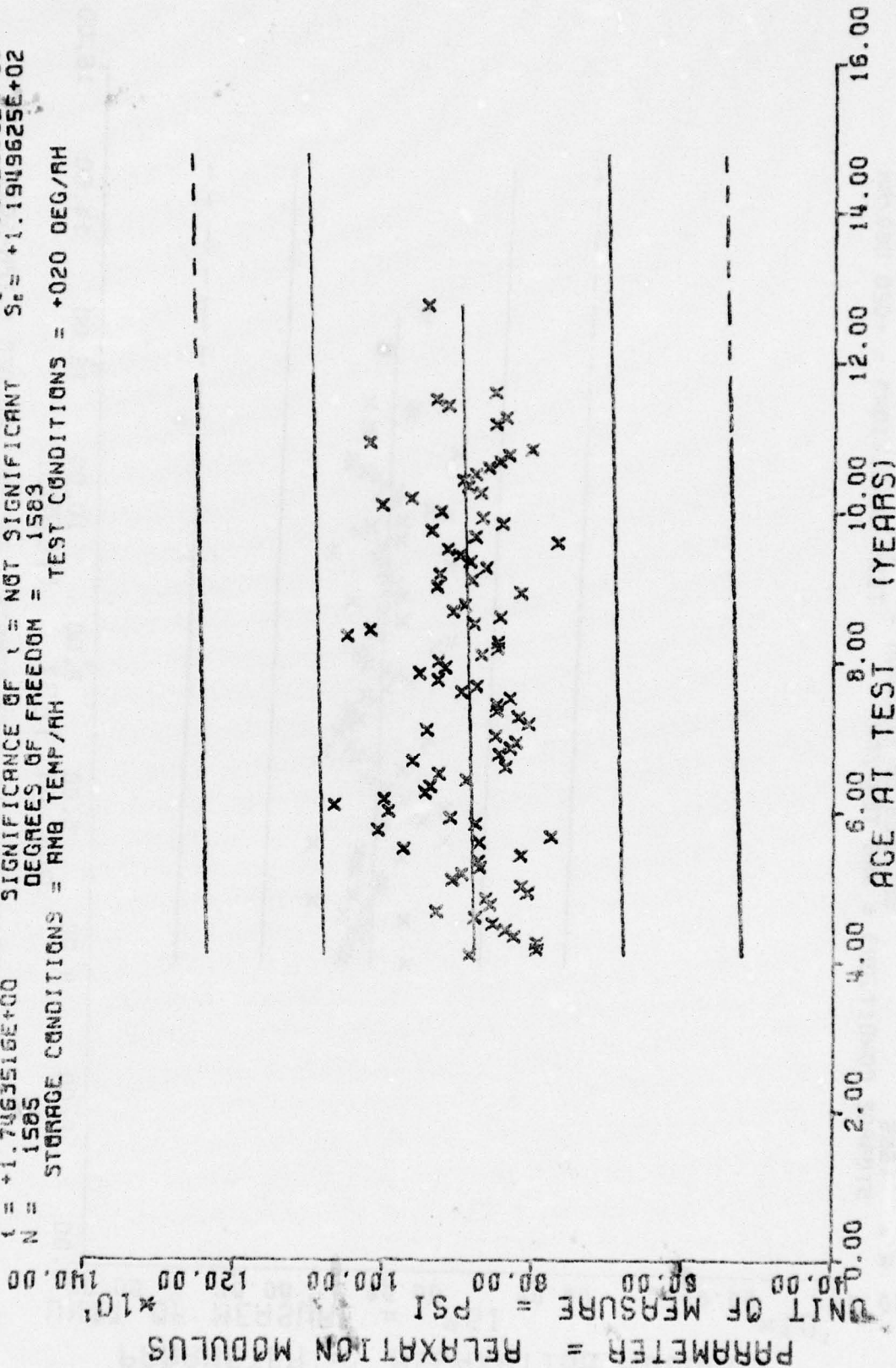
$\gamma = 11 + 1.0252116E+03$  ) + ( +1.2052649E-01 ) \* X1  
 F = +1.9832124E+00 SIGNIFICANCE OF F = NOT SIGNIFICANT  $G_1 = +1.4025291E+02$   
 R = +3.5373032E-02 SIGNIFICANCE OF R = NOT SIGNIFICANT  $S_1 = +1.2819064E-01$   
 I = +1.4082657E+00 SIGNIFICANCE OF I = NOT SIGNIFICANT  $S_2 = +1.4020940E+02$   
 N = 1585 DEGREES OF FREEDOM = 1583  
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = +020 DEG/RH



WING 6. STRESS RELAXATION MODULUS, 3.0% STRAIN, 50 SEC, 20 DEG F, TPH-1011

Figure 35

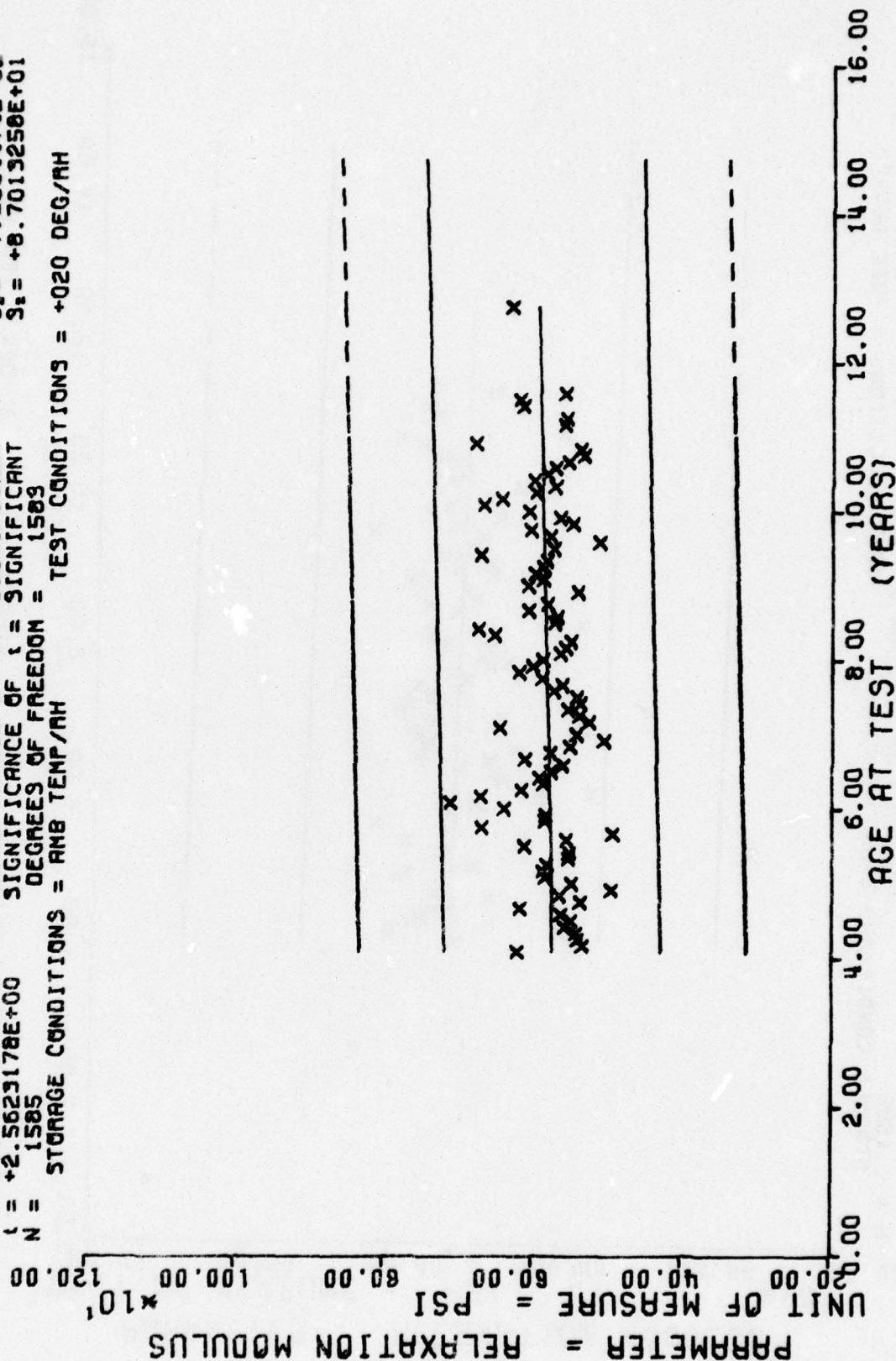
$Y = ((+8.7079857E+02) + (+1.9079420E-01) * X)$   
 SIGNIFICANCE OF F = NOT SIGNIFICANT  $G = +1.1957354E+02$   
 SIGNIFICANCE OF R = NOT SIGNIFICANT  $S_0 = +1.0925302E-01$   
 SIGNIFICANCE OF I = NOT SIGNIFICANT  $S_c = +1.1949625E+02$   
 DEGREES OF FREEDOM = 1583  
 STORAGE CONDITIONS = RMB TEMP/RR TEST CONDITIONS = +020 DEG/RR



WING 6, STRESS RELAXATION MODULUS, 3.0% STRAIN, 100 SEC, 20 DEG F, TPH-1011

Figure 36

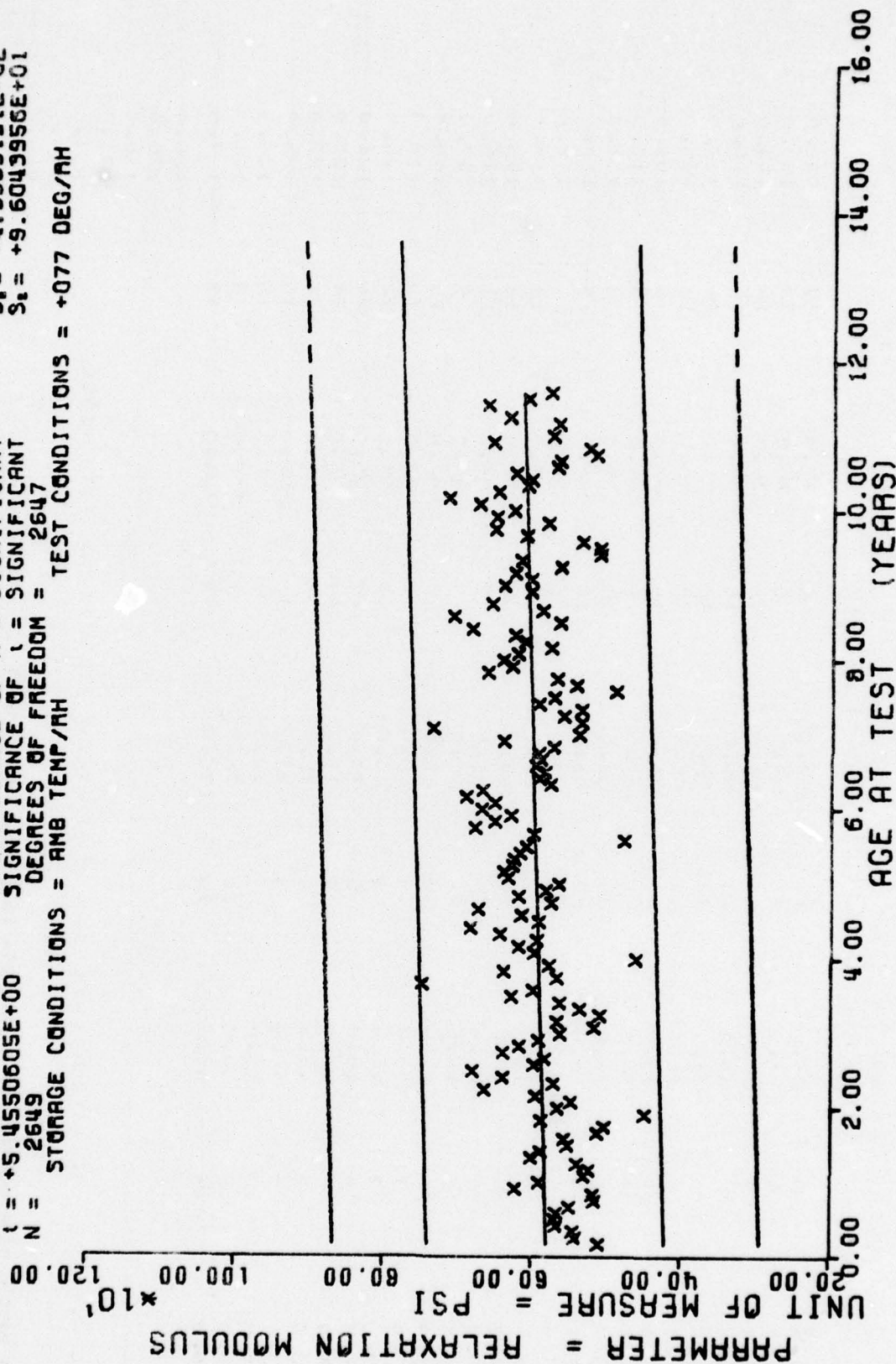
$\gamma = ((+5.6424298E+02) + (+2.0384384E-01) \times X)$   
 $F = +6.5654727E+00$  SIGNIFICANCE OF F = SIGNIFICANT  $G_1 = +8.7165986E+01$   
 $R = +6.4267852E-02$  SIGNIFICANCE OF R = SIGNIFICANT  $S_0 = +7.9554474E-02$   
 $I = +2.5623178E+00$  SIGNIFICANCE OF I = SIGNIFICANT  $S_2 = +8.7013258E+01$   
 $N = 1585$  DEGREES OF FREEDOM = 1583  
 STORAGE CONDITIONS = AMB TEMP/AH TEST CONDITIONS = +020 DEG/AH



WING 6. STRESS RELAXATION MODULUS, 3.0% STRAIN, 1000 SEC, 20 DEG F, TPH-1011

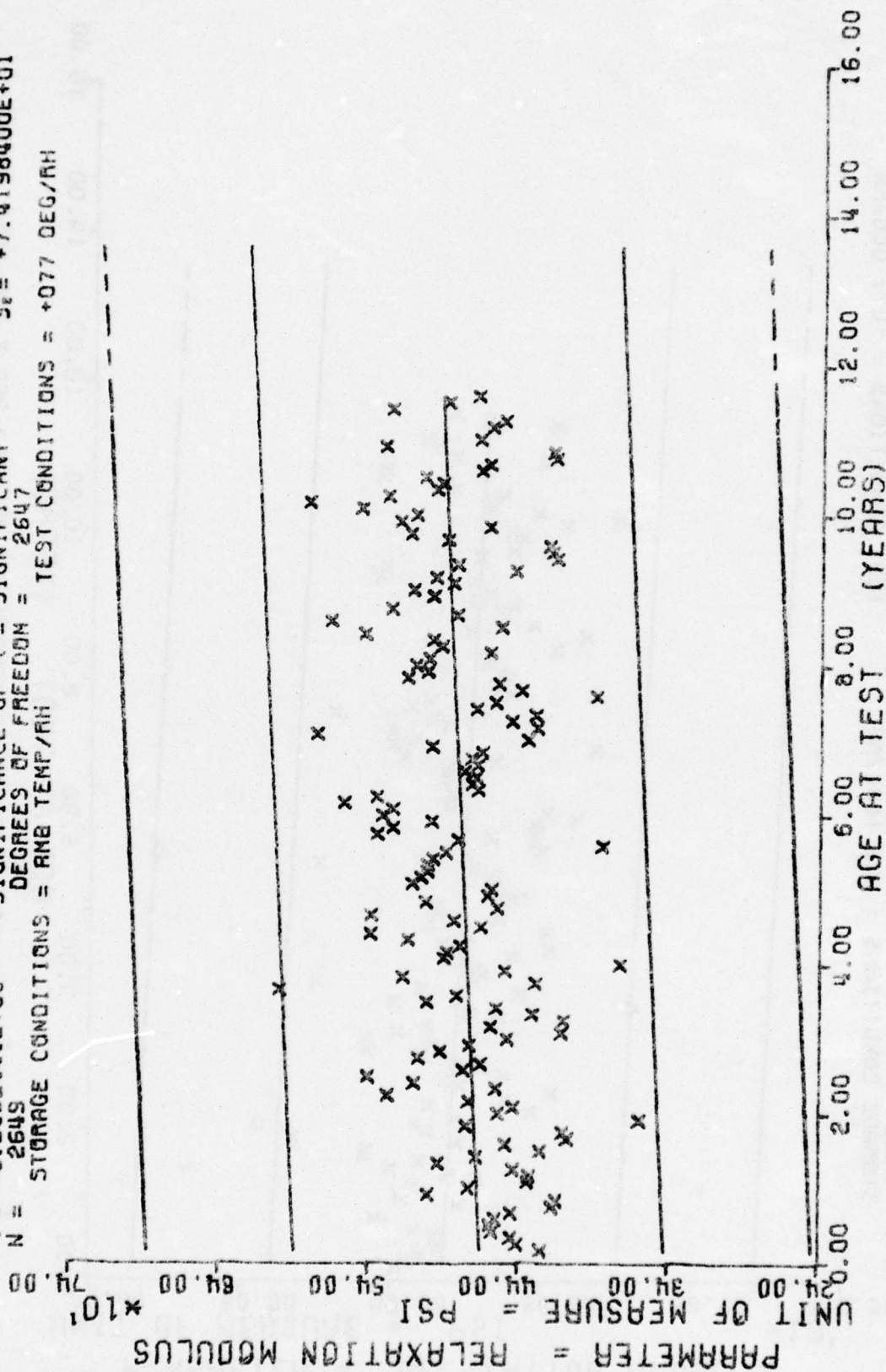


$F = +2.9757686E+01$   
 $R = +1.0543748E-01$   
 $t = +5.4550605E+00$   
 $N = 2649$   
 $Y = ((+5.8072800E+02) + ( +2.6399502E-01 ) * X)$   
 SIGNIFICANCE OF F = SIGNIFICANT  
 SIGNIFICANCE OF R = SIGNIFICANT  
 SIGNIFICANCE OF t = SIGNIFICANT  
 DEGREES OF FREEDOM = 2647  
 STORAGE CONDITIONS = AMB TEMP/AM  
 TEST CONDITIONS = +077 DEG/AM



WING 6. STRESS RELAXATION MODULUS, 3.0% STRAIN, 10 SEC, 77 DEG F, TPH-1011

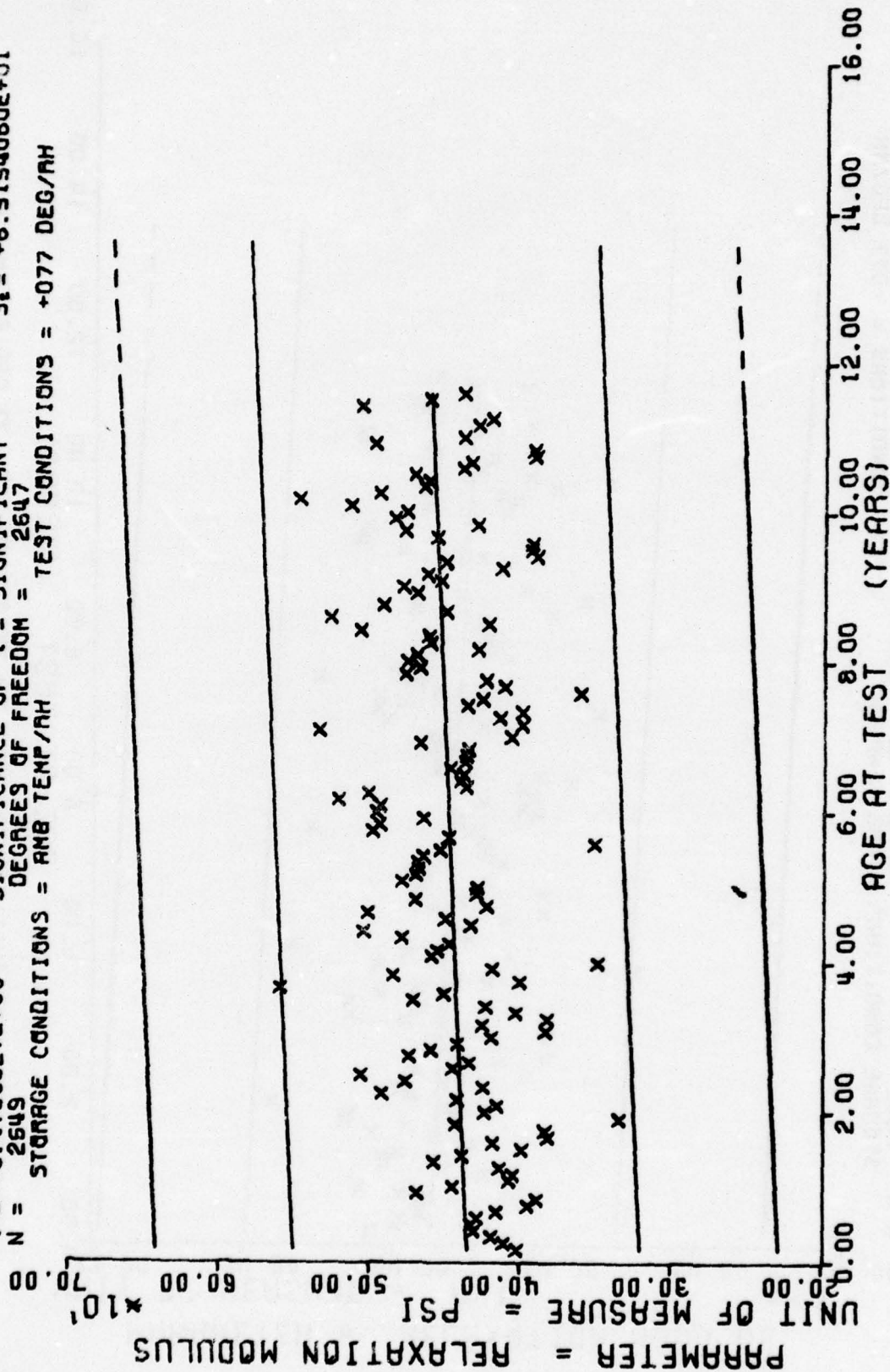
$Y = ((+4.6601425E+02) + (+2.0570149E-01) * X)$   
 $F = +3.0285695E+01$  SIGNIFICANCE OF F = SIGNIFICANT  
 $R = +1.0635290E-01$  SIGNIFICANCE OF R = SIGNIFICANT  
 $t = +5.5032441E+00$  SIGNIFICANCE OF t = SIGNIFICANT  
 $N = 2645$  DEGREES OF FREEDOM = 2647  
 STORAGE CONDITIONS = RMB TEMP/RH TEST CONDITIONS = +077 DEG/RH



WING 6-STRESS RELAXATION MODULUS, 3.0% STRAIN, 50 SEC, 77 DEG F, TPH-1011

Figure 39

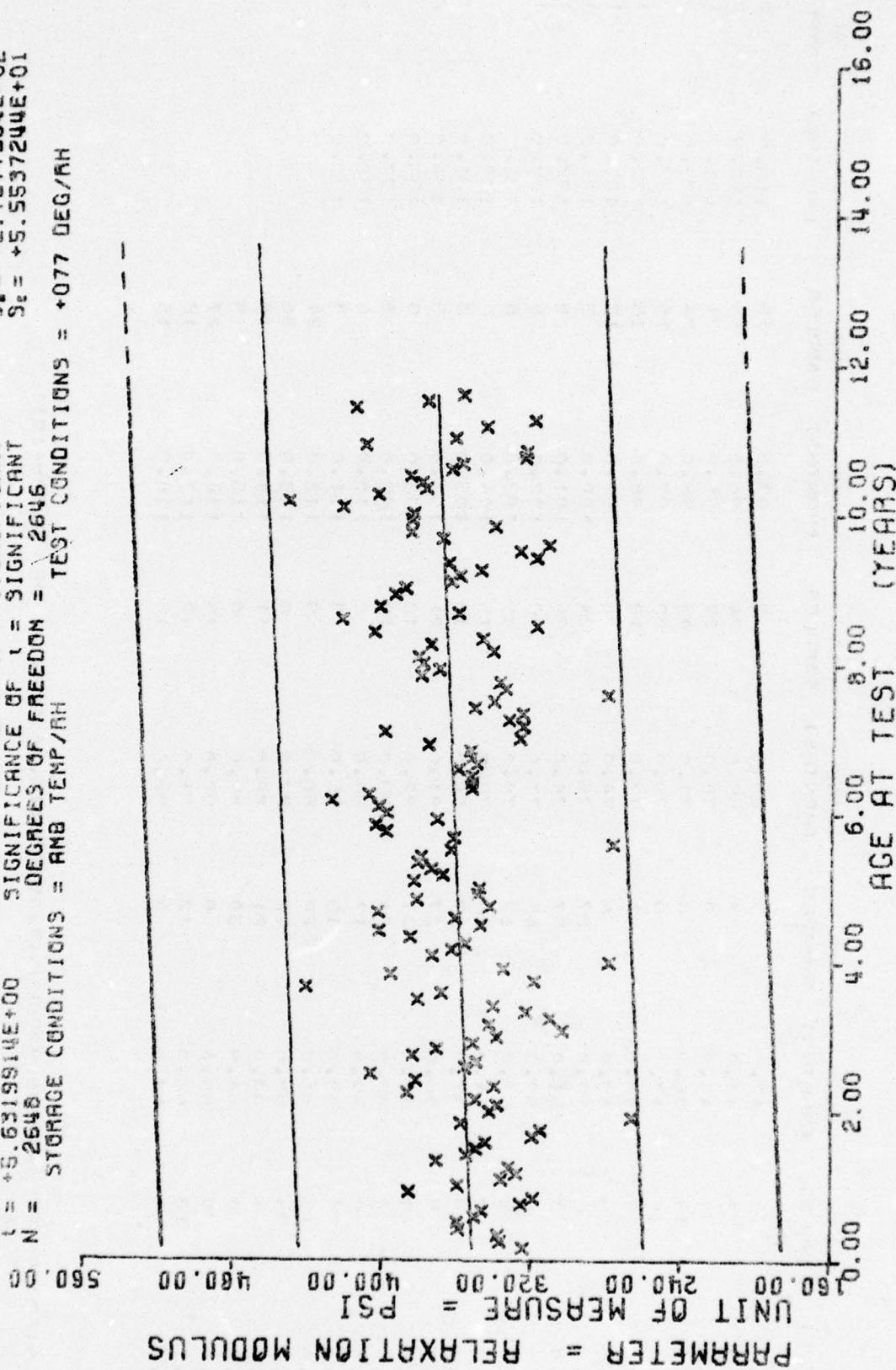
$Y = (( +4.3594671E+02 ) + ( +1.9077006E-01 ) \times X)$   
 $F = +2.9987263E+01$  SIGNIFICANCE OF F = SIGNIFICANT  $G = +6.9531540E+01$   
 $R = +1.0589888E-01$  SIGNIFICANCE OF R = SIGNIFICANT  $S_1 = +3.4837084E-02$   
 $I = +5.4760627E+00$  SIGNIFICANCE OF I = SIGNIFICANT  $S_2 = +6.9154060E+01$   
 $N = 2649$  DEGREES OF FREEDOM = 2647  
 STORAGE CONDITIONS = AMB TEMP/AM TEST CONDITIONS = +077 DEG/AM



WING 6 STRESS RELAXATION MODULUS, 3.0% STRAIN, 100 SEC, 77 DEG F, TPH-1011

Figure 40

$Y = (1 + 3.5177292E+02) + (+1.5757176E-01) \times X$   
 $F = +3.1719327E+01$  SIGNIFICANCE OF F = SIGNIFICANT  
 $R = +1.0882772E-01$  SIGNIFICANCE OF R = SIGNIFICANT  
 $t = +5.6319914E+00$  SIGNIFICANCE OF t = SIGNIFICANT  
 $N = 2648$  DEGREES OF FREEDOM = 2646  
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = +077 DEG/RH



WING C. STRESS RELAXATION MODULUS, 3.0% STRAIN, 1000 SEC, 77 DEG F, TPH-1011

Figure 41

\*\*\* SAMPLE SIZE SUMMARY \*\*\*

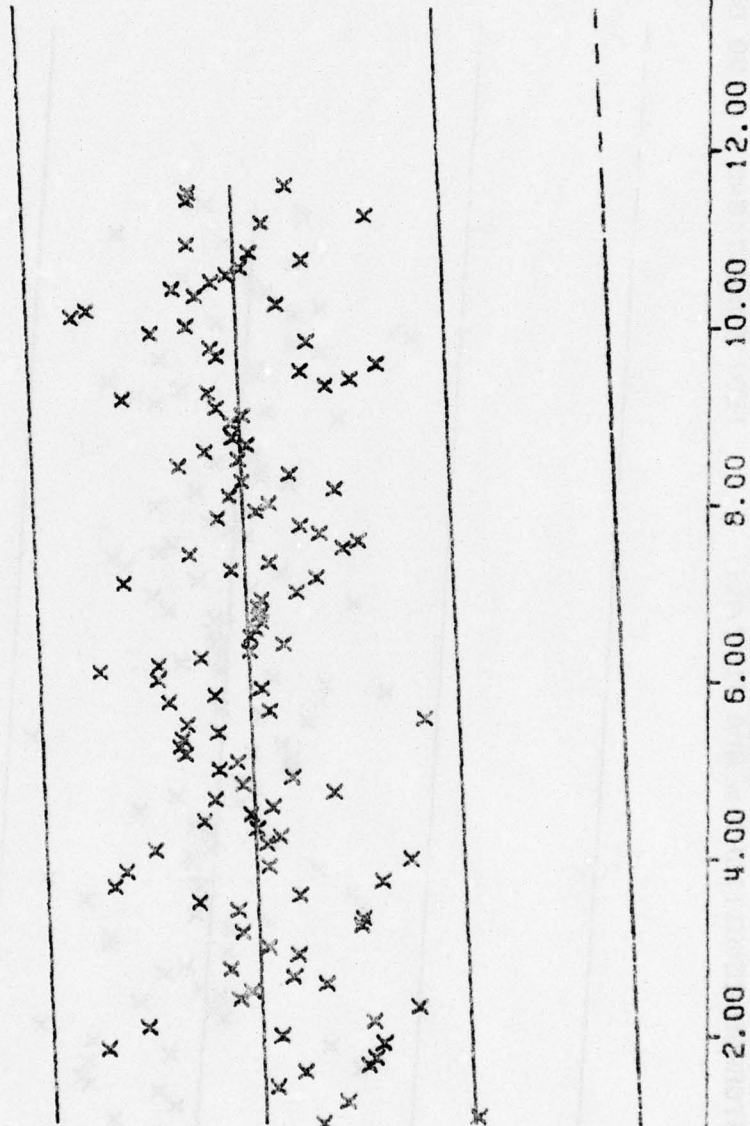
AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES
17.0	3	42.0	9	68.0	9	93.0	15
17.0	7	44.0	3	69.0	24	94.0	15
18.0	6	45.0	9	70.0	27	95.0	21
17.0	15	46.0	6	71.0	45	96.0	24
18.0	6	47.0	9	72.0	39	97.0	15
19.0	3	48.0	3	73.0	18	98.0	18
20.0	9	49.0	6	74.0	36	99.0	12
20.0	3	50.0	27	75.0	24	100.0	3
20.0	3	51.0	57	76.0	26	101.0	9
20.0	6	52.0	45	77.0	30	102.0	6
21.0	9	53.0	12	78.0	30	103.0	6
21.0	9	54.0	28	79.0	15	104.0	6
20.0	3	55.0	27	80.0	18	105.0	3
20.0	9	56.0	27	81.0	21	107.0	5
20.0	9	57.0	31	82.0	12	108.0	9
21.0	3	58.0	24	83.0	12	109.0	5
22.0	9	59.0	12	84.0	9	110.0	6
22.0	9	60.0	15	85.0	3	111.0	3
23.0	15	61.0	20	86.0	9	112.0	24
23.0	24	62.0	48	87.0	6	113.0	36
20.0	6	63.0	21	88.0	11	114.0	18
20.0	9	64.0	30	89.0	6	115.0	9
20.0	9	65.0	9	90.0	15	116.0	27
21.0	12	66.0	12	91.0	12	117.0	18
20.0	6	67.0	3	92.0	15	118.0	15

WING 6. STRESS RELAXATION MODULUS, 3.0% STRAIN, 10 SEC, 100 DEG F, TPRH-1011

This sample size summary is applicable to figures 42 thru 45

$\gamma = \{ (+4.4564794E+02) + (+1.8872642E-01) \} \times X$   
 F = +1.3255768E+01 SIGNIFICANCE OF F = SIGNIFICANT  $G_1 = +7.0726767E+01$   
 R = +8.5808495E-02 SIGNIFICANCE OF R = SIGNIFICANT  $S_1 = +5.1835853E-02$   
 t = +3.6408472E+00 SIGNIFICANCE OF t = SIGNIFICANT  $S_2 = +7.0485609E+01$   
 N = 1789 DEGREES OF FREEDOM = 1787  
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = +100 DEG/RH

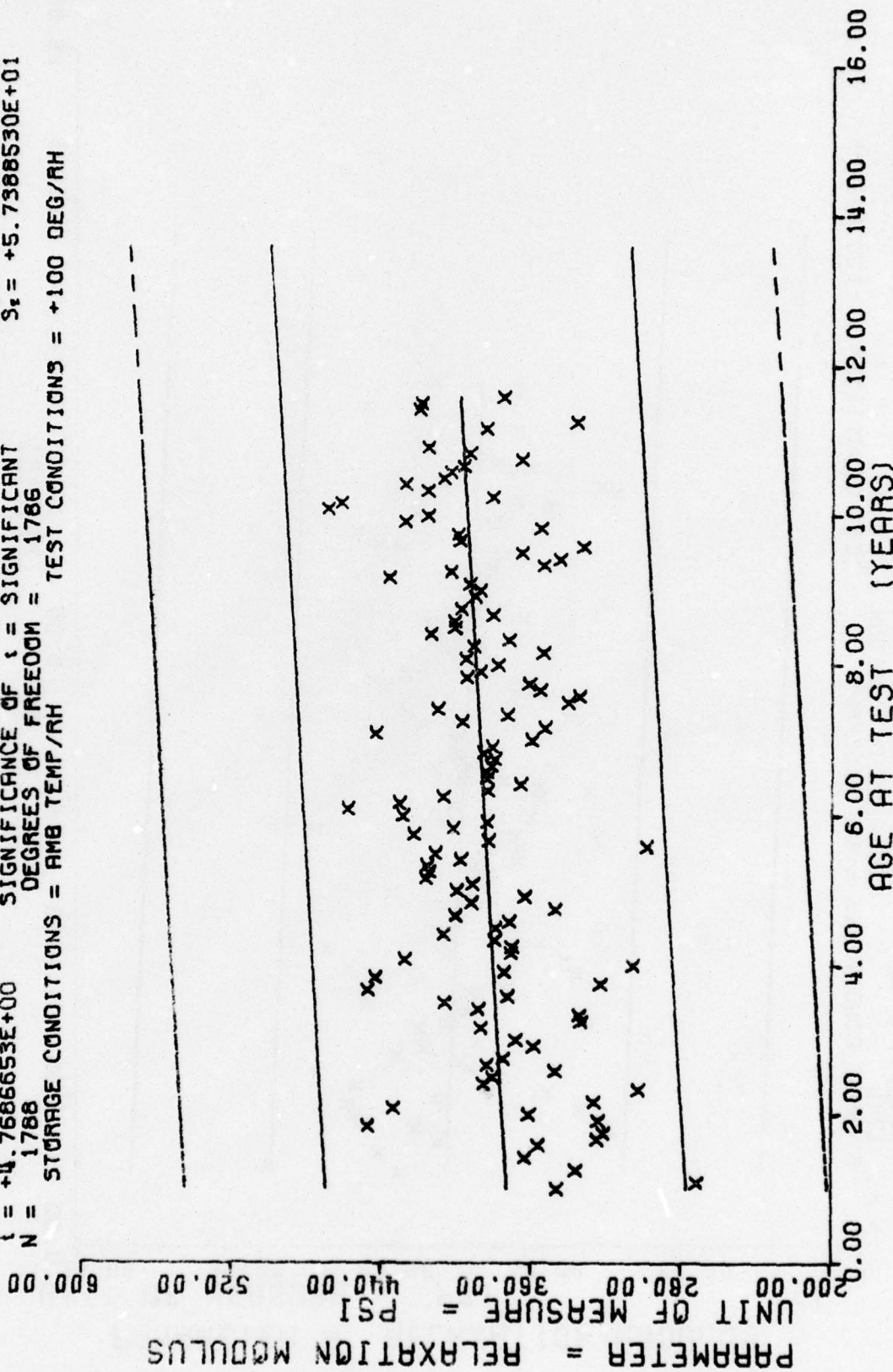
PARAMETER = RELAXATION MODULUS  
 UNIT OF MEASURE = PSI  $\times 10^1$



WING 6, STRESS RELAXATION MODULUS, 3.0% STRAIN, 10 SEC, 100 DEG F, TPH-1011

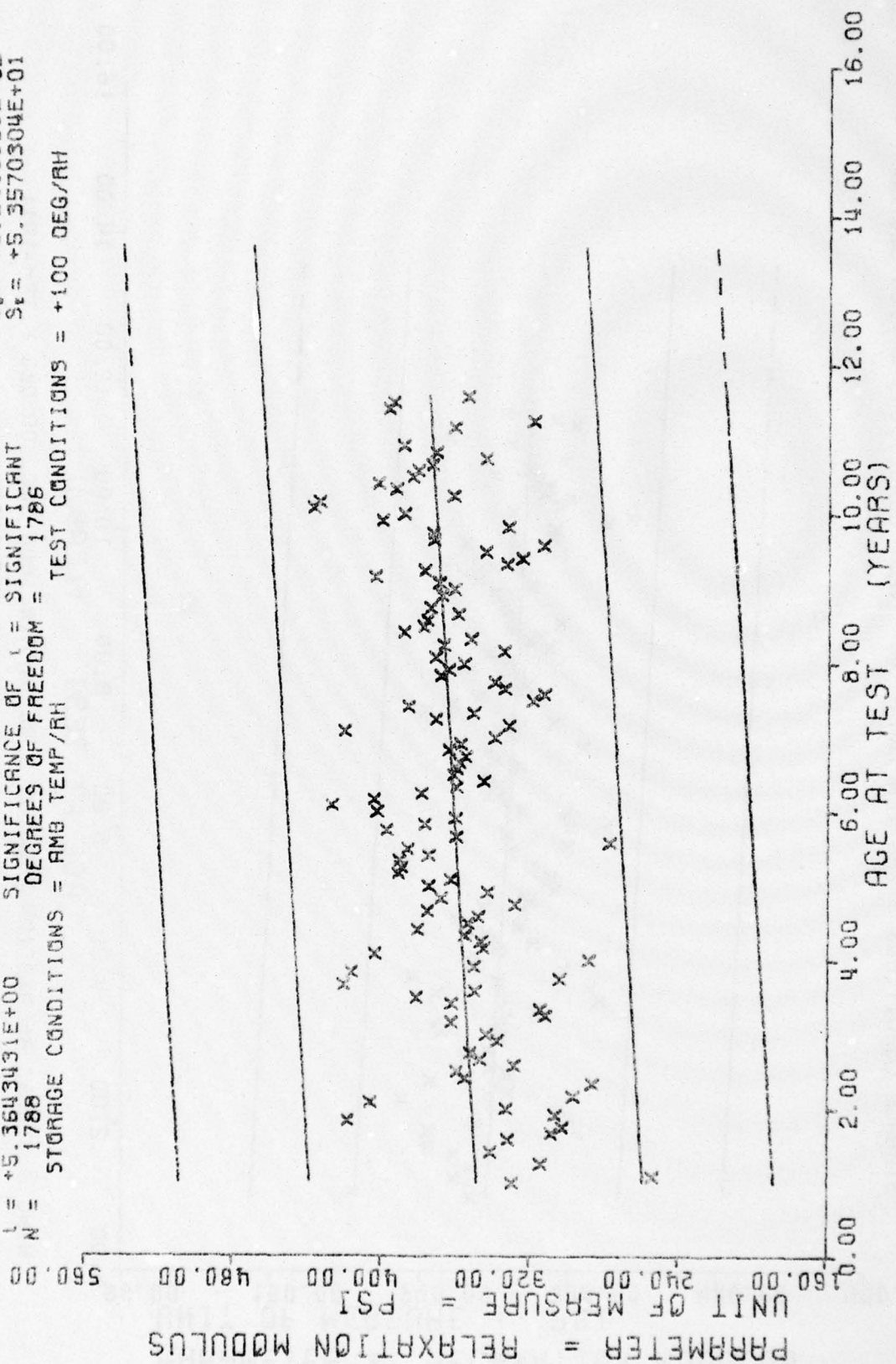
Figure 42

$Y = ((+3.7127143E+02) + (+2.0136297E-01) * X)$   
 $F = +2.2740169E+01$  SIGNIFICANCE OF F = SIGNIFICANT  $G_1 = +5.7736562E+01$   
 $R = +1.1212662E-01$  SIGNIFICANCE OF R = SIGNIFICANT  $S_1 = +4.2226274E-02$   
 $t = +4.7686653E+00$  SIGNIFICANCE OF t = SIGNIFICANT  $S_2 = +5.7388530E+01$   
 $N = 1786$  DEGREES OF FREEDOM = 1786  
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = +100 DEG/RH



WING 6, STRESS RELAXATION MODULUS, 3.0% STRAIN, 50 SEC, 100 DEG F, TPH-1011

$Y = ((+3.4652026E+02) + (+2.1144543E-01) \times X)$   
 $F = +2.8776177E+01$  SIGNIFICANCE OF F = SIGNIFICANT  $S_e = +5.3985033E+01$   
 $R = +1.2592298E-01$  SIGNIFICANCE OF R = SIGNIFICANT  $S_b = +3.9416836E-02$   
 $L = +5.3643431E+00$  SIGNIFICANCE OF L = SIGNIFICANT  $S_c = +5.3570304E+01$   
 $N = 1788$  DEGREES OF FREEDOM = 1786  
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = +100 DEG/RH

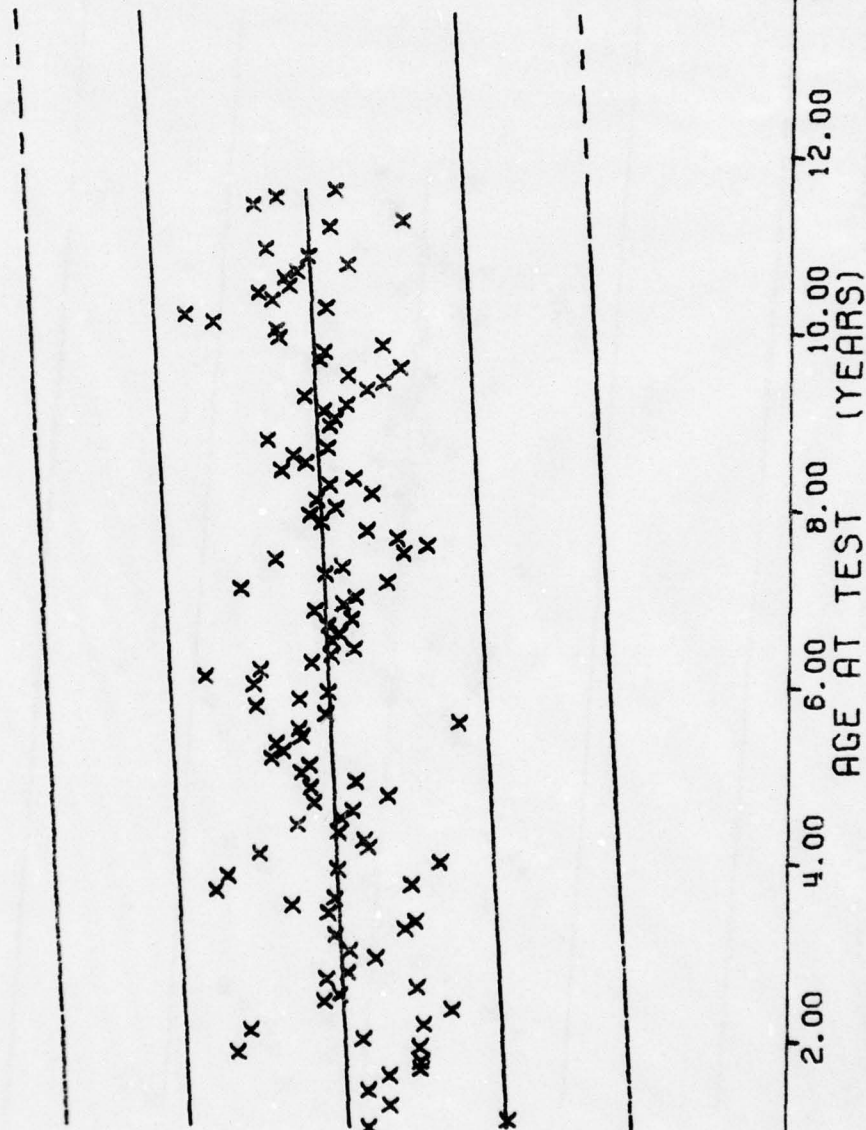


WING 6, STRESS RELAXATION MODULUS, 3.0% STRAIN, 100 SEC, 100 DEG F, TPH-1011

$\bar{Y} = (+2.7470667E+02) + (+1.7881518E-01) \cdot X$   
 SIGNIFICANCE OF F = SIGNIFICANT  
 $S_e = +4.2952363E+01$   
 SIGNIFICANCE OF R = SIGNIFICANT  
 $S_b = +3.1328601E-02$   
 SIGNIFICANCE OF t = SIGNIFICANT  
 $S_c = +4.2577813E+01$   
 DEGREES OF FREEDOM = 1786  
 STORAGE CONDITIONS = AMB TEMP/AM  
 TEST CONDITIONS = +100 DEG/AM

PARAMETER = RELAXATION MODULUS

UNIT OF MEASURE = PSI



WING 6. STRESS RELAXATION MODULUS, 3.0% STRAIN, 1000 SEC, 100 DEG F, TPH-1011

Figure 45

THE UNIVERSITY OF CHICAGO

AGE (MONTHS)	NO. SAMPLES	AGE (MONTHS)	NO. SAMPLES	AGE (MONTHS)	NO. SAMPLES	AGE (MONTHS)	NO. SAMPLES
12.0	3	30.0	27	44.0	30	39.0	6
13.0	3	40.0	18	55.0	9	90.0	12
15.0	6	41.0	18	66.0	12	91.0	15
16.0	3	42.0	12	67.0	3	92.0	12
17.0	12	43.0	6	68.0	9	73.0	15
18.0	6	44.0	3	69.0	27	94.0	18
20.0	6	45.0	9	70.0	45	95.0	17
21.0	6	46.0	6	71.0	51	96.0	27
22.0	3	47.0	9	72.0	39	97.0	14
23.0	8	48.0	6	73.0	18	98.0	18
24.0	18	49.0	6	74.0	12	99.0	12
25.0	18	50.0	27	75.0	24	100.0	3
26.0	18	51.0	60	76.0	30	101.0	9
27.0	15	52.0	54	77.0	30	102.0	5
28.0	24	53.0	12	78.0	30	103.0	6
29.0	45	54.0	27	79.0	14	104.0	3
30.0	70	55.0	27	80.0	17	105.0	3
31.0	57	56.0	24	81.0	18	107.0	6
32.0	51	57.0	33	82.0	12	108.0	9
33.0	27	58.0	24	83.0	12	109.0	6
34.0	57	59.0	9	84.0	9	110.0	6
35.0	30	60.0	17	85.0	3	111.0	3
36.0	45	61.0	24	86.0	9	112.0	21
37.0	18	62.0	48	87.0	12	113.0	36
38.0	12	63.0	21	88.0	12	114.0	18

BEST AVAILABLE COPY

[illegible]

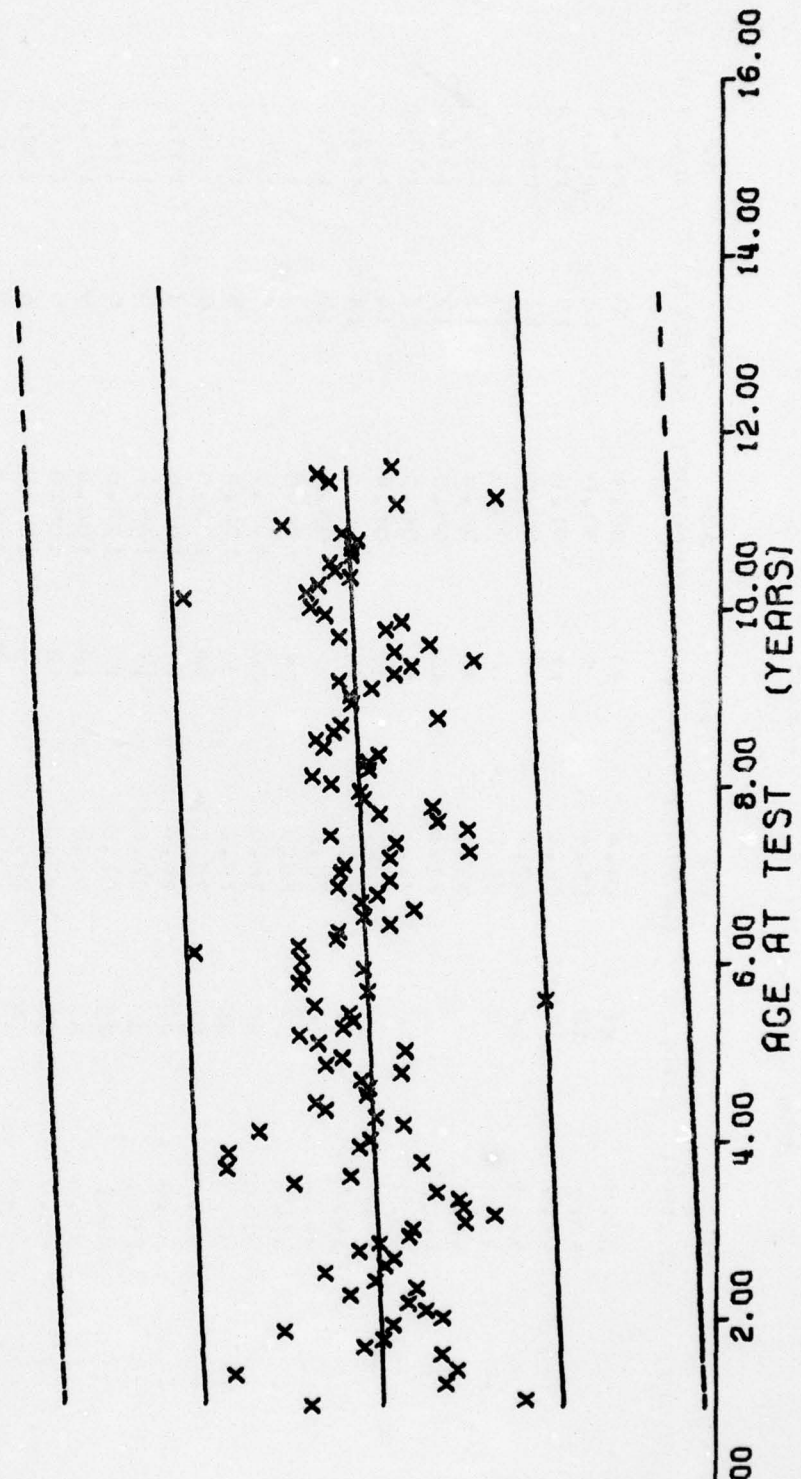
Fig. 6. STRESS RELAXATION MODULUS, 3.0% STRAIN, 10 SEC, 140 DEG F, TPH-1011

This sample size summary is applicable to figures 46 thru 49

$\gamma = ((+3.0723442E+02) + (+1.5686889E-01) * X)$   
 F = +2.6753451E+01      SIGNIFICANCE OF F = SIGNIFICANT  
 R = +1.1055839E-01      SIGNIFICANCE OF R = SIGNIFICANT  
 t = +5.1723738E+00      SIGNIFICANCE OF t = SIGNIFICANT  
 N = 2164      DEGREES OF FREEDOM = 2162  
 STORAGE CONDITIONS = AMB TEMP/RH      TEST CONDITIONS = +140 DEG/RH

PARAMETER = RELAXATION MODULUS

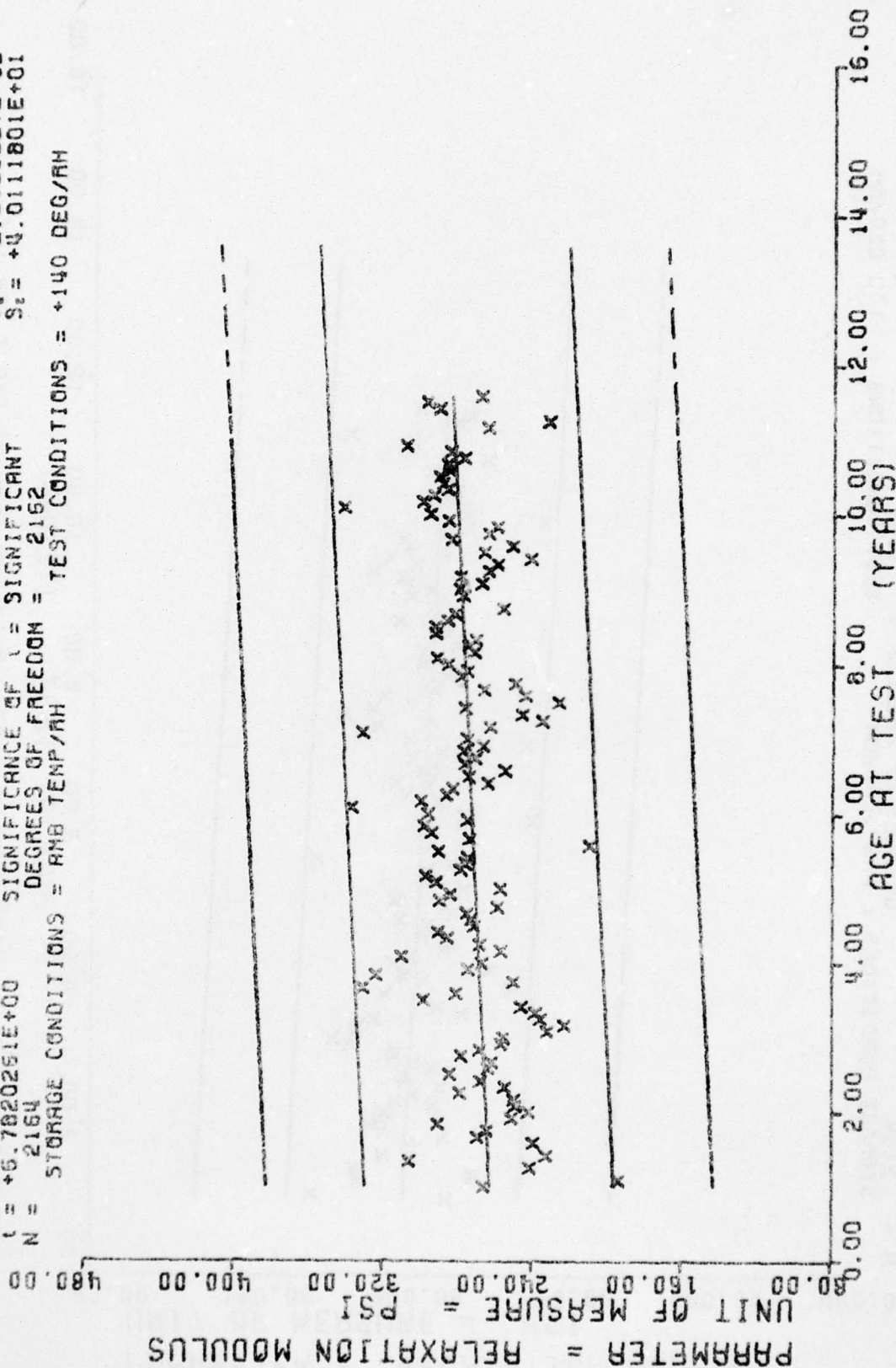
UNIT OF MEASURE = PSI



WING 6, STRESS RELAXATION MODULUS, 3.0% STRAIN, 10 SEC, 140 DEG F, TPH-1011

Figure 46

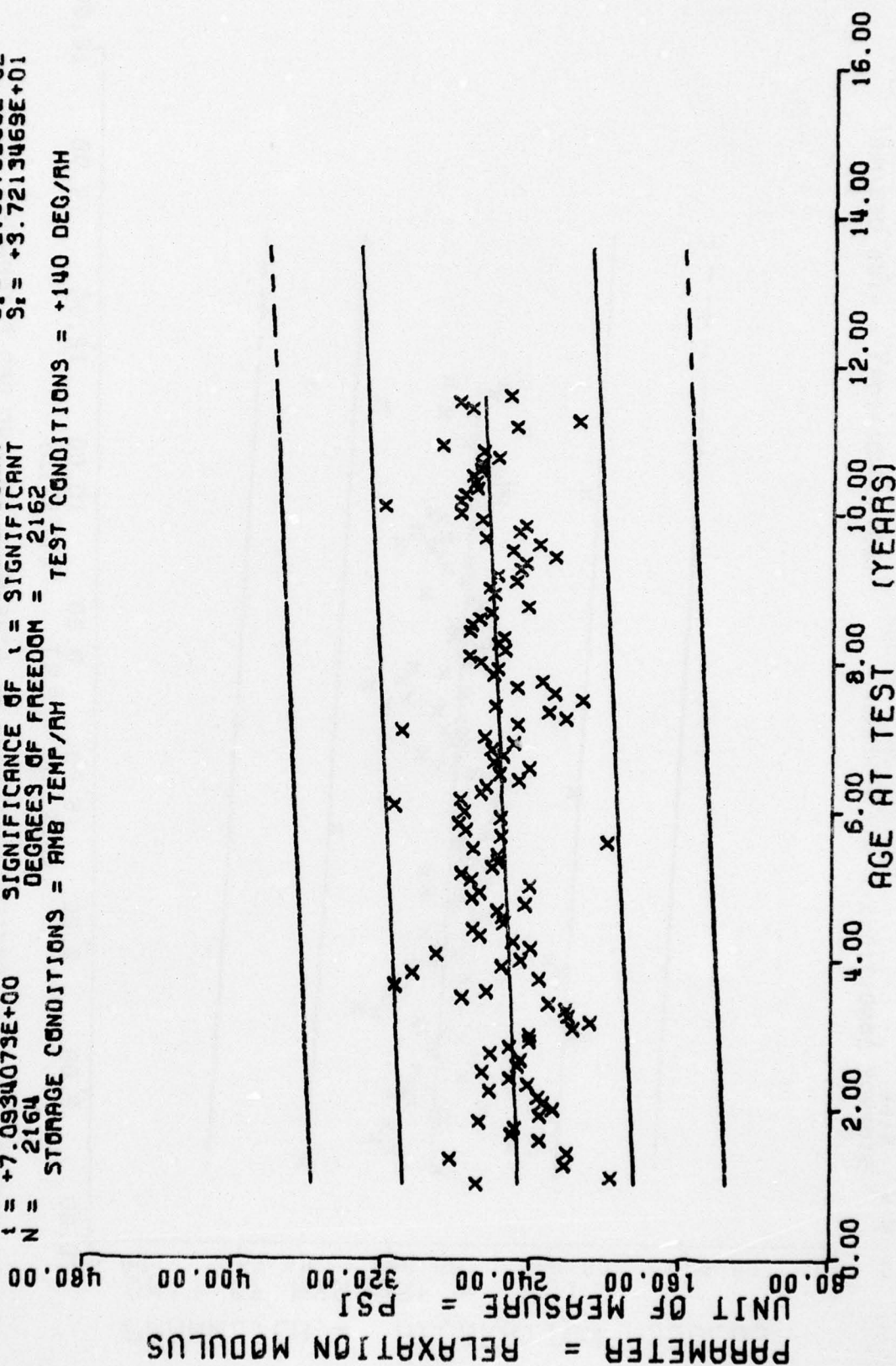
$\gamma = (1 + 2.6114808E+02) + (1.7086587E-01) \times X$   
 F = +4.5995878E+01  
 R = +1.4439123E-01  
 t = +5.7820251E+00  
 N = 2164  
 STORAGE CONDITIONS = RMB TEMP/HR  
 DEGREES OF FREEDOM = 2162  
 SIGNIFICANCE OF F = SIGNIFICANT  
 SIGNIFICANCE OF R = SIGNIFICANT  
 SIGNIFICANCE OF t = SIGNIFICANT  
 TEST CONDITIONS = +140 DEG/HR  
 $G_1 = +4.0526867E+01$   
 $S_1 = +2.5199927E-02$   
 $S_2 = +4.0111801E+01$



MINING 5. STRESS RELAXATION MODULUS, 3.0% STRAIN, 50 SEC, 140 DEG F, TPH-1011

Figure 47

$F = +5.0316427E+01$   
 $H = +1.5081039E-01$   
 $I = +7.0934073E+00$   
 $N = 2164$   
 $Y = ((+2.4489814E+02) + (+1.6579780E-01) * X)$   
 SIGNIFICANCE OF F = SIGNIFICANT  
 SIGNIFICANCE OF H = SIGNIFICANT  
 SIGNIFICANCE OF I = SIGNIFICANT  
 DEGREES OF FREEDOM = 2162  
 STORAGE CONDITIONS = AMB TEMP/AM  
 TEST CONDITIONS = +140 DEG/AM

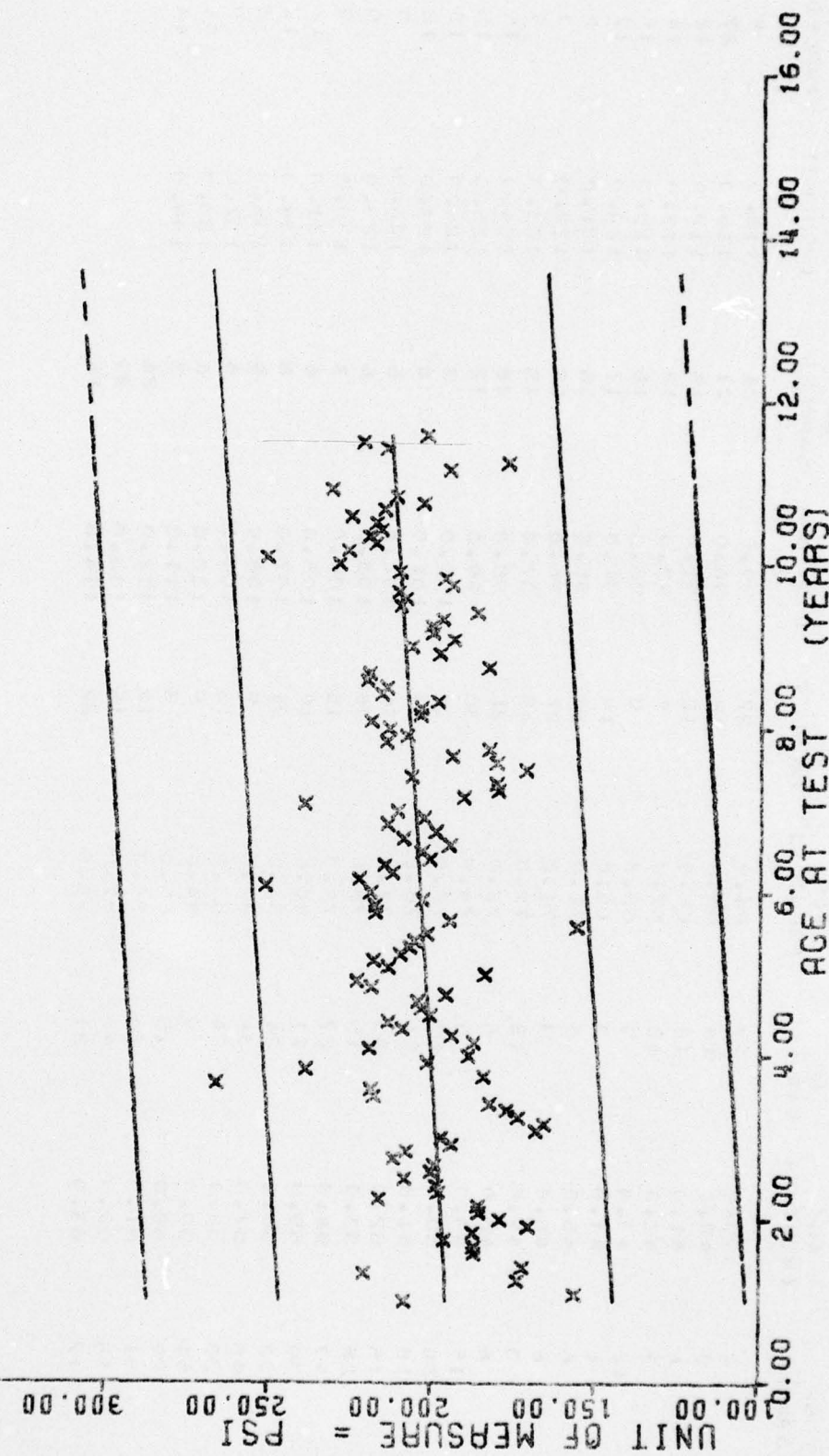


WING 6. STRESS RELAXATION MODULUS, 3.0% STRAIN, 100 SEC, 140 DEG F, TPH-1011

$Y = ((+1.9389042E+02) + (+1.4937376E-01) * X)$   
 SIGNIFICANCE OF F = SIGNIFICANT  
 SIGNIFICANCE OF R = SIGNIFICANT  
 SIGNIFICANCE OF U = SIGNIFICANT  
 DEGREES OF FREEDOM = 2157  
 STORAGE CONDITIONS = ANG TEMP/RH  
 TEST CONDITIONS = +140 DEG/RH

F = +5.5315455E+01  
 R = +1.5812470E-01  
 U = +7.4374360E+00  
 N = 2159

PARAMETER = RELAXATION MODULUS  
 UNIT OF MEASURE = PSI



WING 6. STRESS RELAXATION MODULUS, 3.0% STRAIN, 1000 SEC, 140 DEG F, TPH-1011

Figure 49

COPY AVAILABLE TO DDC DOES NOT  
PERMIT FULLY LEGIBLE PRODUCTION

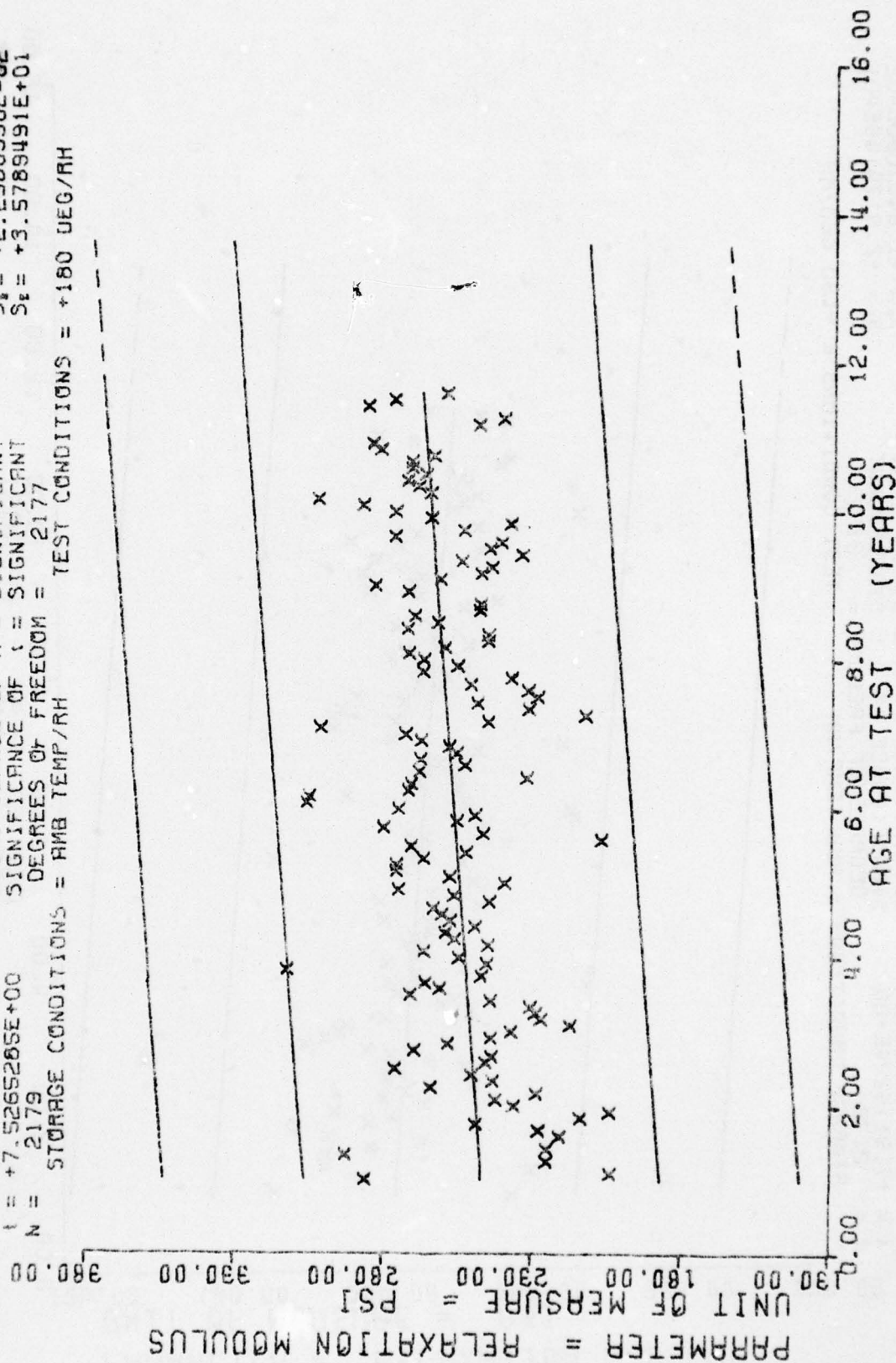
\*\*\* SAMPLE SIZE SUMMARY \*\*\*

AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES
12.0	3	30.0	27	64.0	27	89.0	21
13.0	3	40.0	18	65.0	12	90.0	21
15.0	6	41.0	12	66.0	12	91.0	15
16.0	3	42.0	12	67.0	3	92.0	12
17.0	12	43.0	9	68.0	9	93.0	15
19.0	6	44.0	3	69.0	18	94.0	17
20.0	6	45.0	6	70.0	20	95.0	18
21.0	6	46.0	3	71.0	27	96.0	27
22.0	3	47.0	12	72.0	45	97.0	15
23.0	6	48.0	6	73.0	21	98.0	18
24.0	15	49.0	6	74.0	30	99.0	12
25.0	20	50.0	27	75.0	27	100.0	3
26.0	15	51.0	51	76.0	33	101.0	9
27.0	15	52.0	53	77.0	24	102.0	6
28.0	26	53.0	15	78.0	36	103.0	6
29.0	47	54.0	27	79.0	15	104.0	3
30.0	39	55.0	27	80.0	18	105.0	6
31.0	33	56.0	24	81.0	21	107.0	6
32.0	48	57.0	36	82.0	9	108.0	9
33.0	20	58.0	24	83.0	15	109.0	6
34.0	51	59.0	9	84.0	9	110.0	6
35.0	27	60.0	15	85.0	3	111.0	3
36.0	51	61.0	24	86.0	12	112.0	24
37.0	18	62.0	46	87.0	15	113.0	39
38.0	12	63.0	21	88.0	27	114.0	15

WING 6, STRESS RELAXATION MODULUS, 3.0% STRAIN, 10 SEC, 180 DEG F, IPH-1011

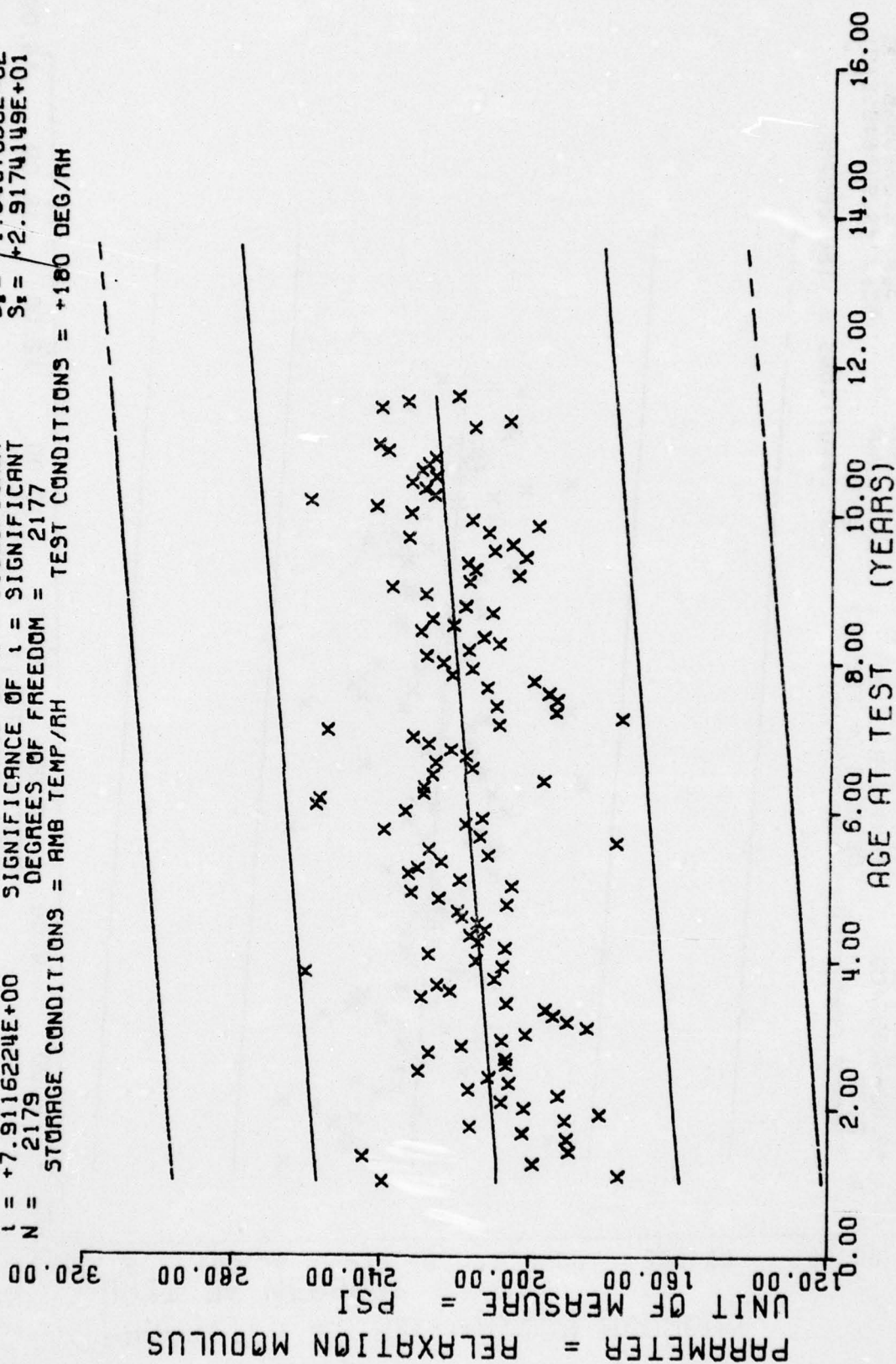
This sample size summary is applicable to figures 50 thru 53

$Y = ( (+2.4497350E+02) + (+1.6995516E-01) ) * X$   
 $F = +5.6648631E+01$  SIGNIFICANCE OF F = SIGNIFICANT  
 $q = +1.5925287E-01$  SIGNIFICANCE OF R = SIGNIFICANT  
 $t = +7.5265285E+00$  SIGNIFICANCE OF t = SIGNIFICANT  
 $N = 2179$  DEGREES OF FREEDOM = 2177  
 STORAGE CONDITIONS = HMB TEMP/RH TEST CONDITIONS = +180 DEG/RH



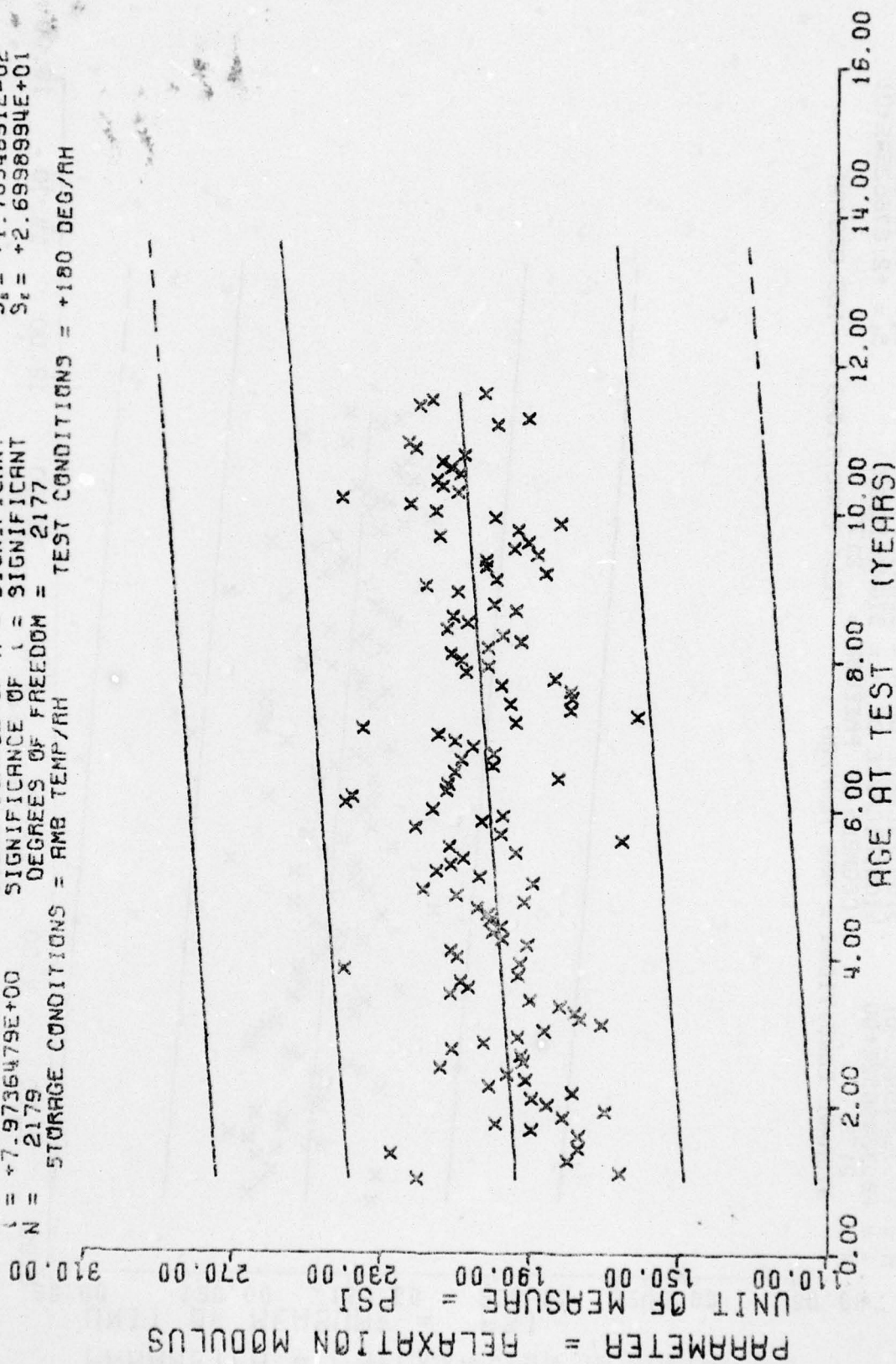
WING 6. STRESS RELAXATION MODULUS. 3.0% STRAIN, 10 SEC, 180 DEG F. TPH-1011

$Y = ((+2.0683869E+02) + (+1.4562986E-01) * X)$   
 $F = +6.2593769E+01$  SIGNIFICANCE OF F = SIGNIFICANT  $G = +2.9583795E+01$   
 $R = +1.6717869E-01$  SIGNIFICANCE OF R = SIGNIFICANT  $S_0 = +1.8407080E-02$   
 $l = +7.9116224E+00$  SIGNIFICANCE OF l = SIGNIFICANT  $S_1 = +2.9174149E+01$   
 $N = 2179$  DEGREES OF FREEDOM = 2177  
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = +180 DEG/RH



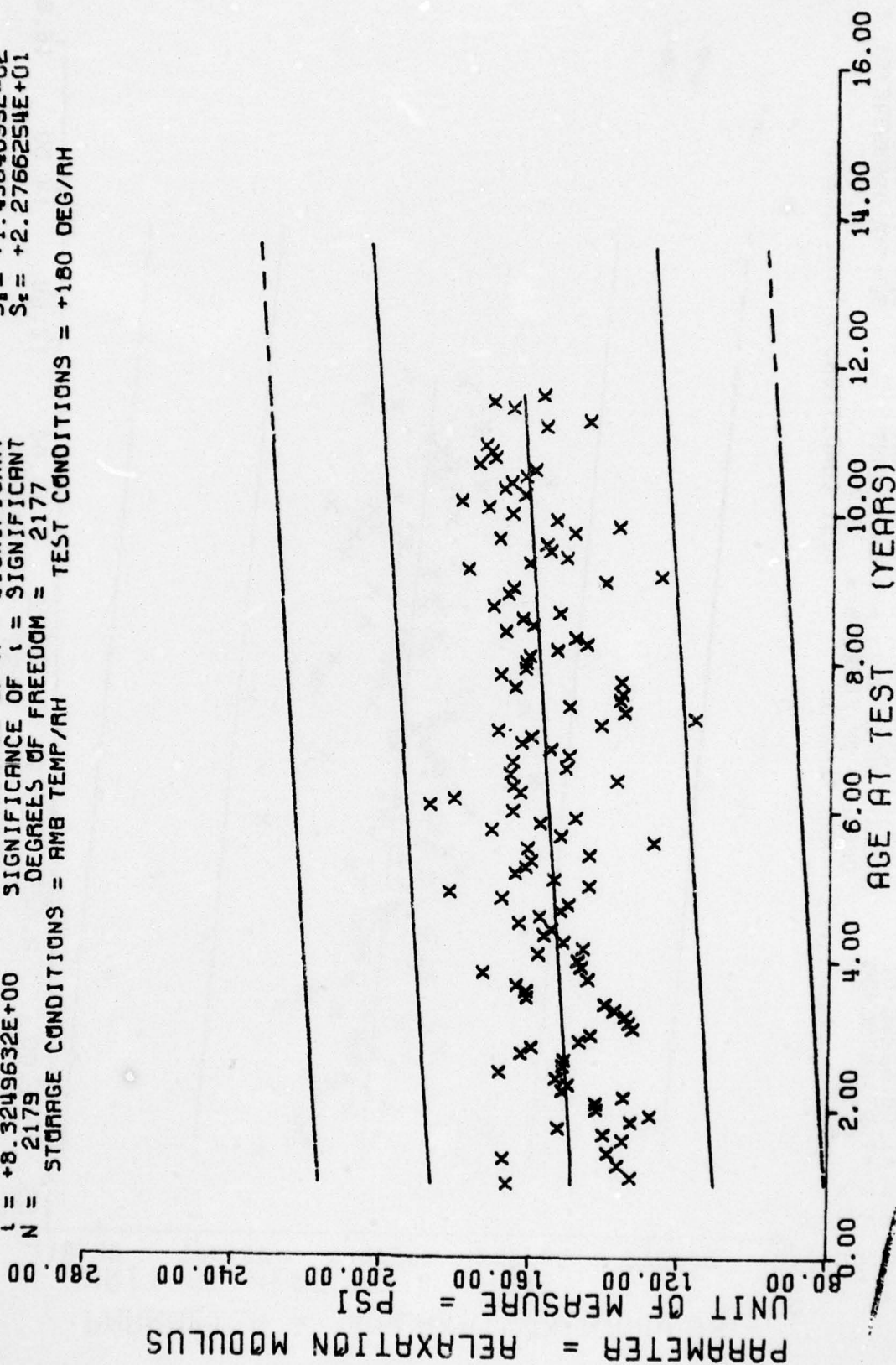
WING 6, STRESS RELAXATION MODULUS, 3.0% STRAIN, 50 SEC, 180 DEG F, TPH-1011

$Y = ((+1.9227409E+02) + (+1.3582863E-01) * X)$   
 $F = +6.3579061E+01$  SIGNIFICANCE OF F = SIGNIFICANT  
 $R = +1.6845229E-01$  SIGNIFICANCE OF R = SIGNIFICANT  
 $S_e = +7.9736479E+00$  SIGNIFICANCE OF  $S_e$  = SIGNIFICANT  
 $N = 2179$  DEGREES OF FREEDOM = 2177  
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = +180 DEG/RH



WING 6.5 STRESS RELAXATION MODULUS, 3.0% STRAIN, 100 SEC, 180 DEG F, TPH-101

$F = +6.9305012E+01$   
 $R = +1.7564992E-01$   
 $L = +8.3249632E+00$   
 $N = 2179$   
 $Y = (( +1.4713041E+02 ) + ( +1.1958056E-01 ) * X)$   
 SIGNIFICANCE OF F = SIGNIFICANT  
 SIGNIFICANCE OF R = SIGNIFICANT  
 SIGNIFICANCE OF L = SIGNIFICANT  
 DEGREES OF FREEDOM = 2177  
 STORAGE CONDITIONS = AMB TEMP/RH  
 TEST CONDITIONS = +180 DEG/RH



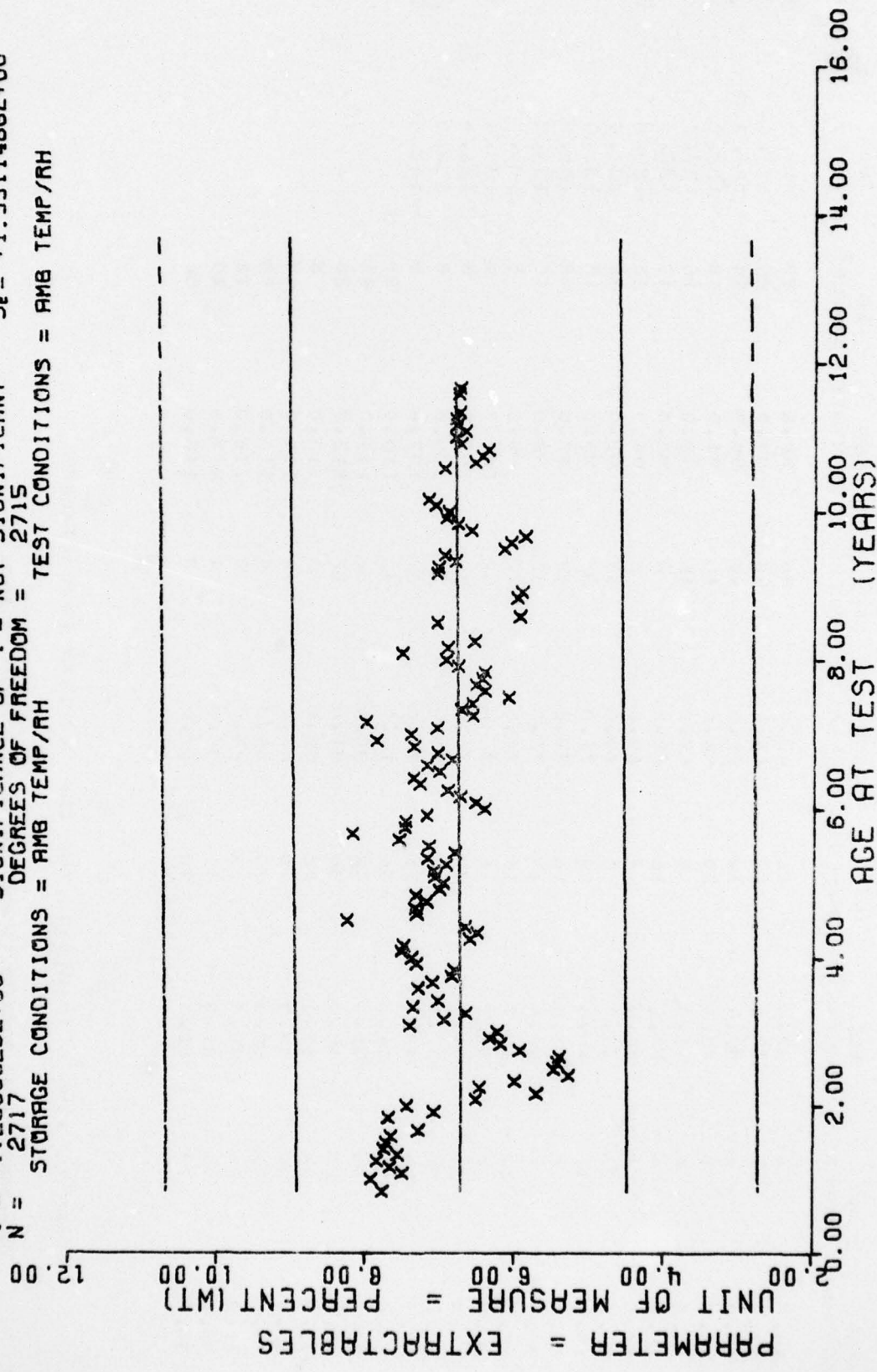
WING 6 STRESS RELAXATION MODULUS, 3.0% STRAIN, 1000 SEC, 180 DEG F, TPH-1011

[illegible]

STAGE 1. WING 6 TP-H1011, SOL. GR. PERCENT EXTRACTABLES

This sample size summary is applicable to figures 54 thru 56

$Y = ((+6.6999262E+00) + (+9.4718026E-04) * X)$   
 F = +1.8665580E+00 SIGNIFICANCE OF F = NOT SIGNIFICANT  $\sigma = +1.3313119E+00$   
 R = +2.4768063E-02 SIGNIFICANCE OF R = NOT SIGNIFICANT  $S_e = +7.3370659E-04$   
 t = +1.2909523E+00 SIGNIFICANCE OF t = NOT SIGNIFICANT  $S_e = +1.3311486E+00$   
 N = 2717 DEGREES OF FREEDOM = 2715  
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = AMB TEMP/RH



STAGE 1, WING 6 TP-H1011, SOL GEL, PERCENT EXTRACTABLES

$F = +1.913602E+02$       SIGNIFICANCE OF F = (+1.4530454E-03) \* X)  
 $R = +2.568686E-01$       SIGNIFICANCE OF R = SIGNIFICANT  
 $t = +1.3854097E+01$       SIGNIFICANCE OF t = SIGNIFICANT  
 $N = 2719$       DEGREES OF FREEDOM = 2717  
 STORAGE CONDITIONS = RMS TEMP/RH      TEST CONDITIONS = RMS TEMP/RH

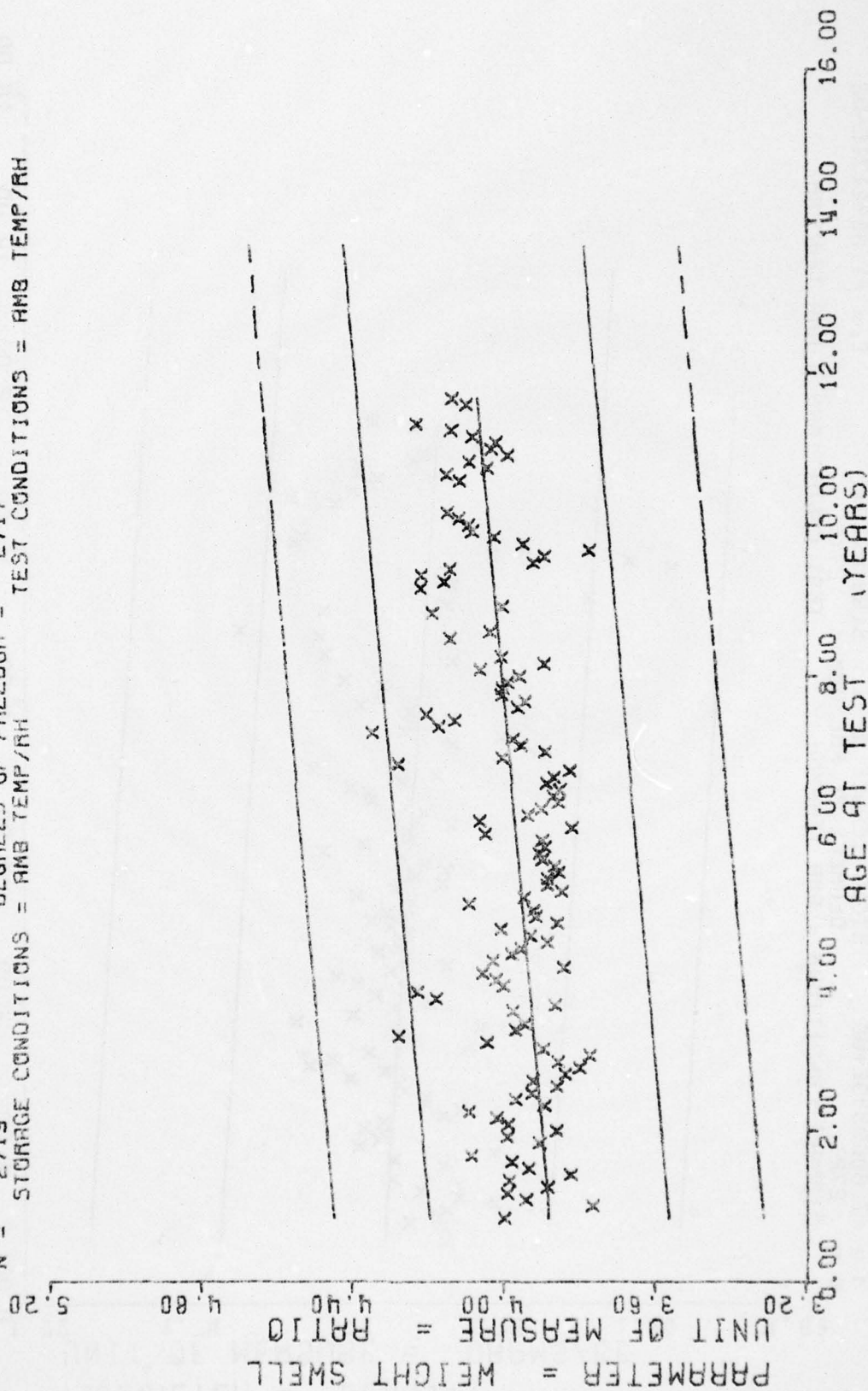


Figure 55

AD-A041 671

OGDEN AIR LOGISTICS CENTER HILL AFB UTAH PROPELLANT L--ETC F/G 21/9.2  
PROPELLANT SURVEILLANCE REPORT LGM-30 F AND G STAGE 1. PHASE E.--ETC(U)  
MAY 77 J A THOMPSON

UNCLASSIFIED

MANCP-370(77)

NL

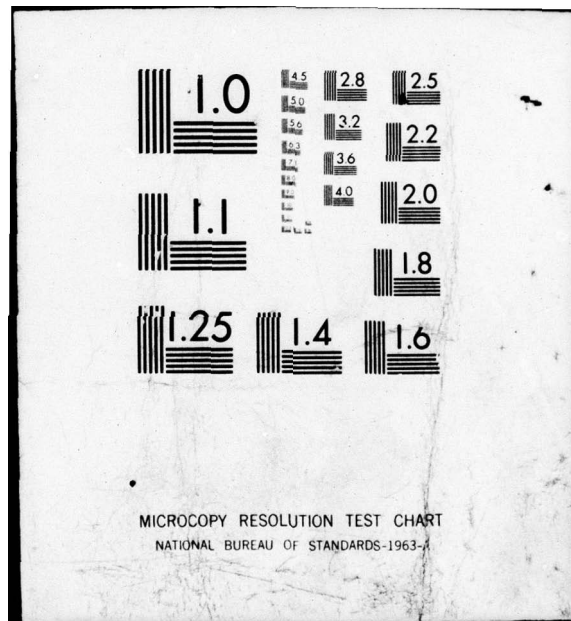
2 OF 2

AD  
A041671

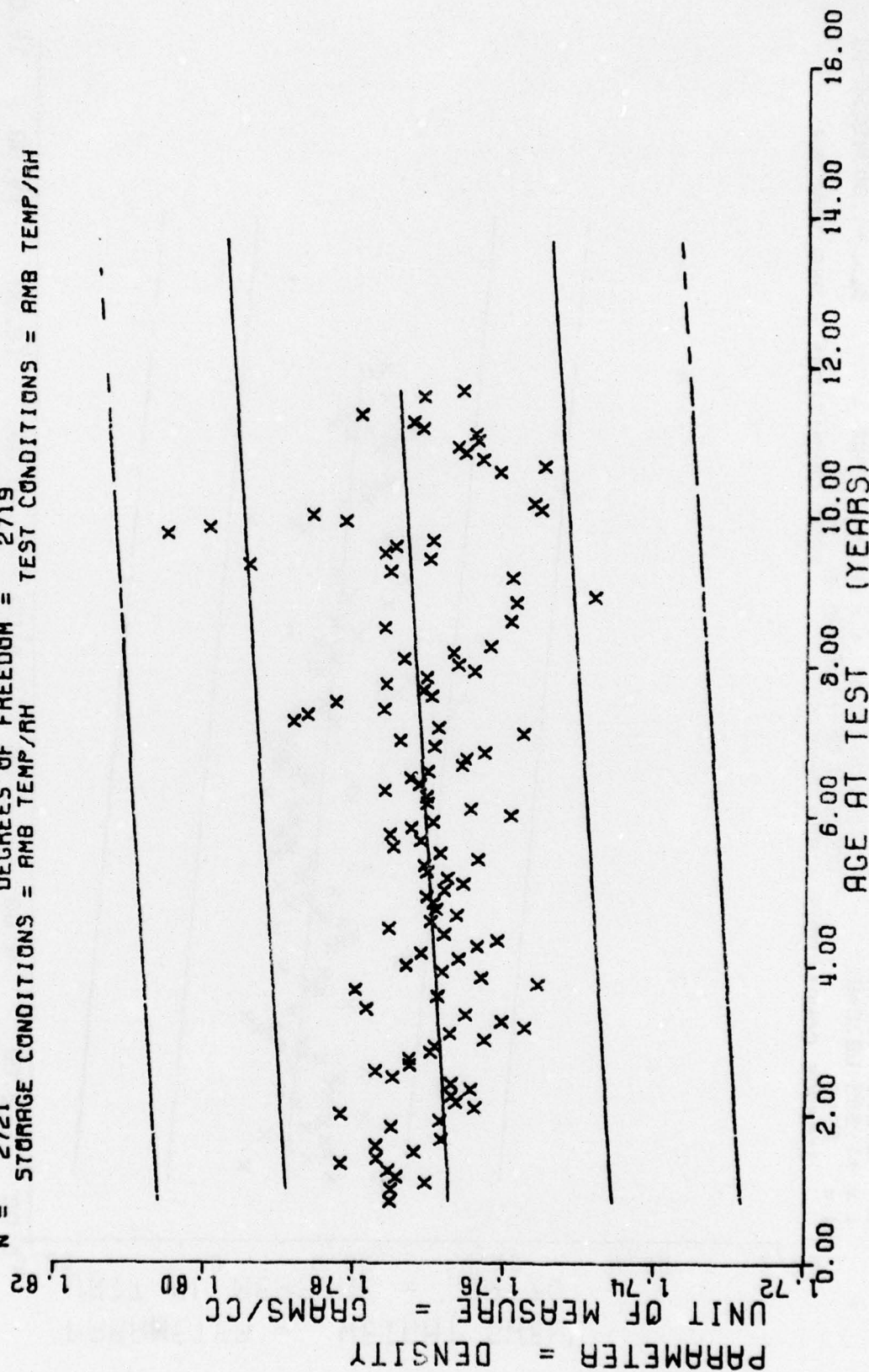
END

DATE \_\_\_\_\_

FILMED  
8-77



$F = +5.9088953E+01$   
 $q = +1.4584114E-01$   
 $l = +7.6869339E+00$   
 $N = 2721$   
 $Y = ((+1.7667897E+00) + (+5.5026079E-05) * X)$   
 SIGNIFICANCE OF F = SIGNIFICANT  
 SIGNIFICANCE OF R = SIGNIFICANT  
 SIGNIFICANCE OF l = SIGNIFICANT  
 DEGREES OF FREEDOM = 2719  
 STORAGE CONDITIONS = AMB TEMP/RH  
 TEST CONDITIONS = AMB TEMP/RH



STAGE 1, WING 6, TP-H1011, SOL GEL, DENSITY

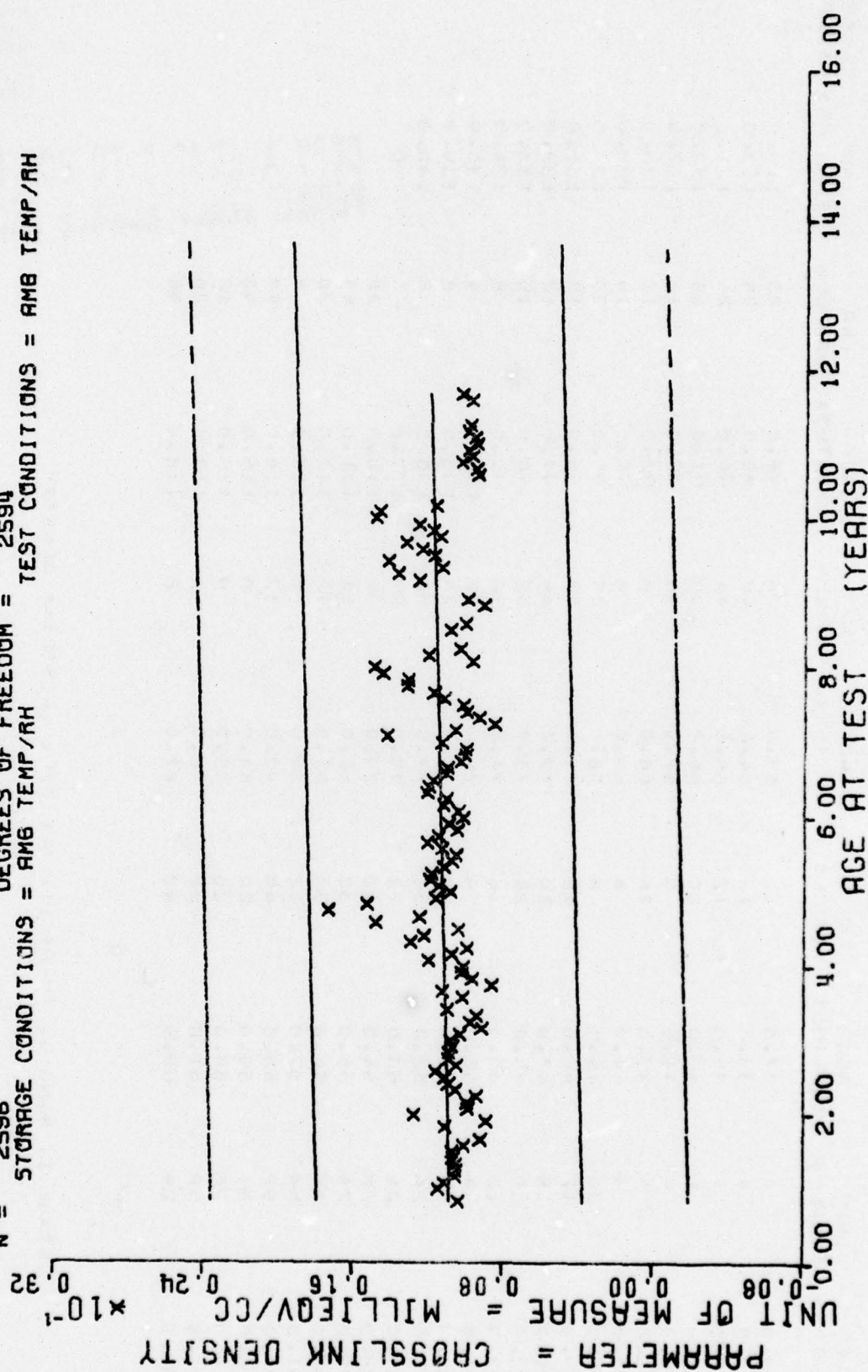
AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES
11.0	4	37.0	12	63.0	36	88.0	20	114.0	64
12.0	4	38.0	12	64.0	48	89.0	28	120.0	68
13.0	6	39.0	12	65.0	44	90.0	24	121.0	20
14.0	8	40.0	20	66.0	16	91.0	40	122.0	8
15.0	4	41.0	8	67.0	16	92.0	16	127.0	24
16.0	6	43.0	16	68.0	8	93.0	12	128.0	8
17.0	4	44.0	4	69.0	8	94.0	16	129.0	40
18.0	20	45.0	8	70.0	12	95.0	20	130.0	16
19.0	12	46.0	12	71.0	32	96.0	12	131.0	31
20.0	8	47.0	16	72.0	44	97.0	12	132.0	24
22.0	8	48.0	24	73.0	32	98.0	16	133.0	4
23.0	12	49.0	16	74.0	72	99.0	8	134.0	12
24.0	4	50.0	8	75.0	52	102.0	4	135.0	8
25.0	28	51.0	20	76.0	40	103.0	8	139.0	12
26.0	24	52.0	60	77.0	32	106.0	8	140.0	16

COPY AVAILABLE TO DDC DOES NOT  
PERMIT FULLY LEGIBLE PRODUCTION

STAGE 1, WING 6, TO-HIC11, SCL GEL, CROSSLINK DENSITY

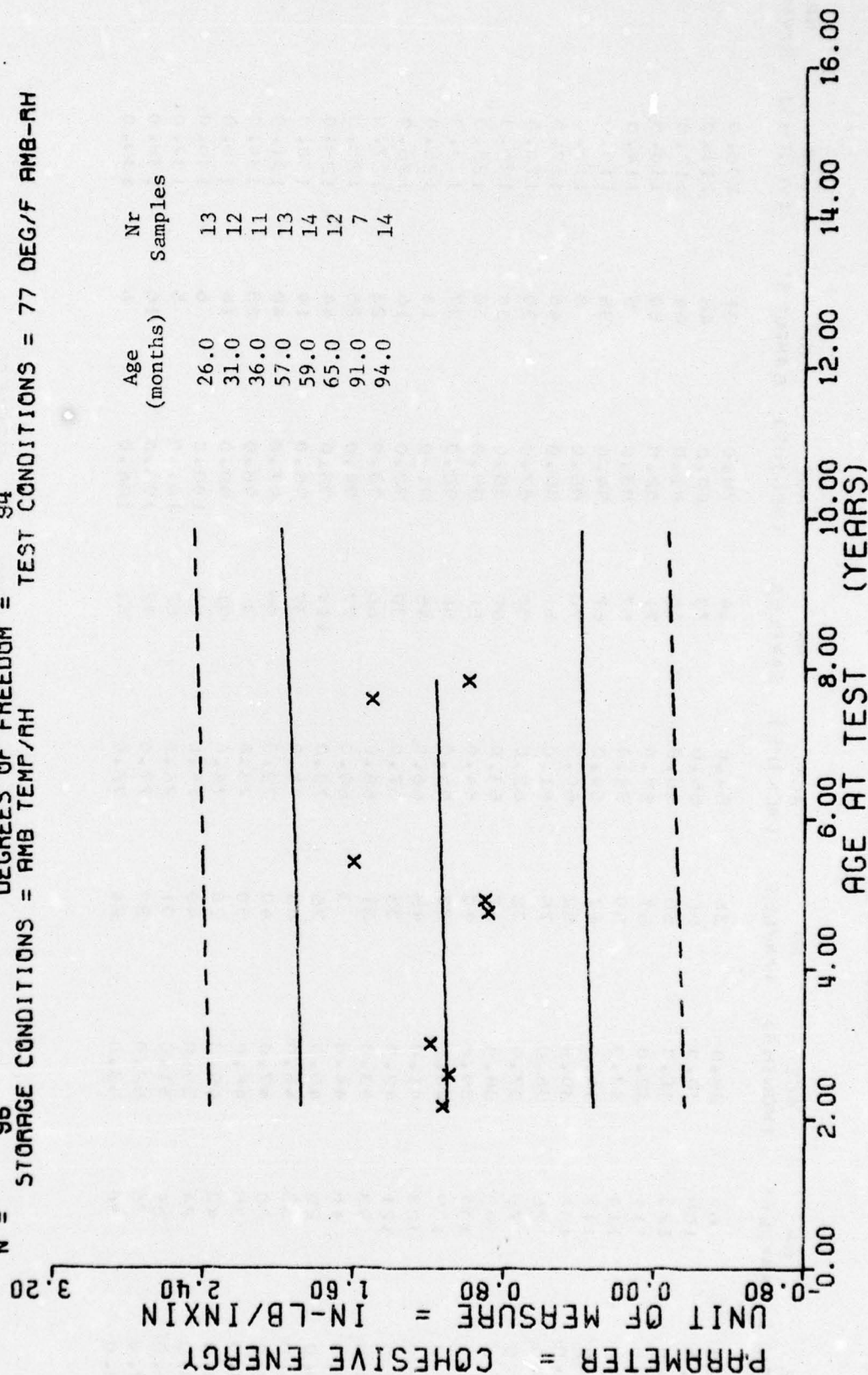
This sample size summary is applicable to figure 57

$Y = ( +1.0757875E-02 ) + ( +9.2483298E-06 ) \times X$   
 $F = +1.3578602E+01$  SIGNIFICANCE OF F = SIGNIFICANT  $G_1 = +4.2765586E-03$   
 $R = +7.2162044E-02$  SIGNIFICANCE OF R = SIGNIFICANT  $S_1 = +2.5097807E-05$   
 $t = +3.6849154E+00$  SIGNIFICANCE OF t = SIGNIFICANT  $S_2 = +4.2662913E-03$   
 $N = 2596$  DEGREES OF FREEDOM = 2594  
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = AMB TEMP/RH



STAGE 1, WING 6, TP-H1011, SOL GEL, CROSSLINK DENSITY

$Y = ((+1.0801750E+00) + (+9.9006650E-04) * X)$   
 $F = +2.9271067E-01$  SIGNIFICANCE OF F = NOT SIGNIFICANT  $G = +4.2166669E-01$   
 $R = +5.5716037E-02$  SIGNIFICANCE OF R = NOT SIGNIFICANT  $S_1 = +1.8299746E-03$   
 $I = +5.4102742E-01$  SIGNIFICANCE OF I = NOT SIGNIFICANT  $S_2 = +4.2324519E-01$   
 $N = 96$  DEGREES OF FREEDOM = 94  
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = 77 DEG/F AMB-RH

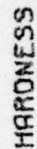


STAGE I WING 6 TP-H1011 TEAR ENERGY TEST/TEMP=77 DEG F

AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES
6.0	60	29.0	36	54.0	54	79.0	31	106.0	5
6.0	108	30.0	66	55.0	73	80.0	48	111.0	3
7.0	122	31.0	56	56.0	48	81.0	64	112.0	21
7.0	114	32.0	67	57.0	71	82.0	50	113.0	45
8.0	114	33.0	59	58.0	57	83.0	5	114.0	15
9.0	117	34.0	47	59.0	67	84.0	35	115.0	3
10.0	108	35.0	52	60.0	70	85.0	8	116.0	33
11.0	126	36.0	76	61.0	51	86.0	46	117.0	33
12.0	75	37.0	32	62.0	60	87.0	30	118.0	6
13.0	93	38.0	57	63.0	69	88.0	38	120.0	6
14.0	104	39.0	40	64.0	58	89.0	30	123.0	12
15.0	100	40.0	32	65.0	56	90.0	37	124.0	12
16.0	108	41.0	45	66.0	45	91.0	16	125.0	27
17.0	121	42.0	33	67.0	30	92.0	16	126.0	18
18.0	93	43.0	31	68.0	66	93.0	23	127.0	24
19.0	46	44.0	3	69.0	77	94.0	26	128.0	15
20.0	25	45.0	35	70.0	110	95.0	44	129.0	15
21.0	35	46.0	63	71.0	37	96.0	14	130.0	9
22.0	30	47.0	40	72.0	66	97.0	40	131.0	3
23.0	35	48.0	50	73.0	36	98.0	28	134.0	18
24.0	42	49.0	28	74.0	91	99.0	16	135.0	3
25.0	24	50.0	40	75.0	64	100.0	6	136.0	3
26.0	54	51.0	91	76.0	62	101.0	5	137.0	18
27.0	36	52.0	82	77.0	72	103.0	16	138.0	52
28.0	36	53.0	24	78.0	51	104.0	6	139.0	21

STAGE 1 WING 6

This sample size summary is applicable to figure 59

$$Y = [(+6.4774879E+01) + (+6.4305061E-03) \times X]$$


SHORE A, 10 SECOND

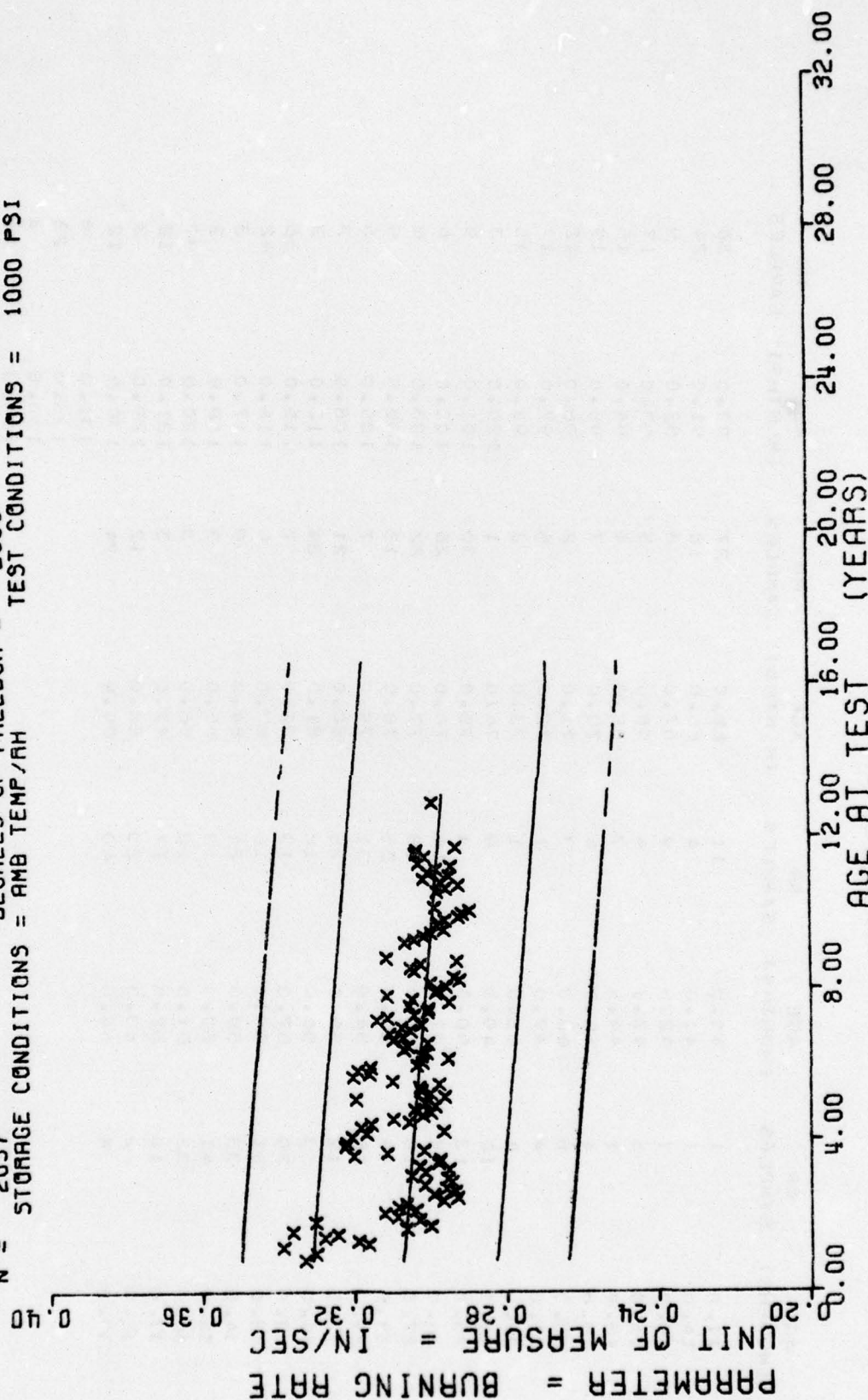
\*\*\* SAMPLE SIZE SUMMARY \*\*\*

AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES
10.0	3	37.0	36	63.0	33	88.0	12	118.0	20
12.0	6	38.0	23	64.0	23	89.0	13	119.0	27
14.0	6	39.0	14	65.0	16	90.0	28	120.0	29
15.0	3	40.0	24	66.0	6	91.0	14	121.0	18
16.0	6	41.0	12	67.0	15	92.0	11	122.0	15
17.0	6	42.0	25	68.0	12	93.0	9	127.0	13
18.0	12	43.0	9	69.0	6	94.0	8	128.0	9
19.0	3	44.0	6	70.0	21	95.0	14	129.0	30
20.0	3	45.0	6	71.0	10	96.0	15	130.0	12
21.0	6	46.0	9	72.0	30	97.0	18	131.0	23
22.0	3	47.0	15	73.0	29	98.0	25	132.0	12
23.0	3	49.0	12	74.0	47	99.0	9	133.0	8
24.0	3	50.0	15	75.0	56	100.0	13	134.0	9
25.0	6	51.0	3	76.0	36	102.0	6	135.0	6
26.0	17	52.0	13	77.0	27	103.0	6	136.0	6
27.0	12	53.0	12	78.0	11	104.0	4	138.0	6
28.0	18	54.0	32	79.0	36	105.0	3	139.0	29
29.0	25	55.0	24	80.0	15	106.0	14	140.0	12
30.0	9	56.0	17	81.0	21	111.0	12	141.0	12
31.0	24	57.0	30	82.0	15	112.0	12	155.0	3
32.0	28	58.0	39	83.0	12	113.0	6	175.0	3
33.0	46	59.0	30	84.0	11	114.0	39		
34.0	32	60.0	38	85.0	6	115.0	20		
35.0	40	61.0	15	86.0	6	116.0	16		
36.0	46	62.0	40	87.0	12	117.0	21		

STAGE I WING 6 TP-H1011 BURNING RATE AT 1000 PSI

This sample size summary is applicable to figure 60

$Y = (1 + 3.0807508E-01) + (-7.5370000E-05) * X$   
 $F = +6.4581419E+01$  SIGNIFICANCE OF F = SIGNIFICANT  
 $R = -1.7538297E-01$  SIGNIFICANCE OF R = SIGNIFICANT  
 $t = +8.0362565E+00$  SIGNIFICANCE OF t = SIGNIFICANT  
 $N = 2037$  DEGREES OF FREEDOM = 2035  
 STORAGE CONDITIONS = AMB TEMP/AH TEST CONDITIONS = 1000 PSI



STAGE I WING 6 TP-H1011 BURNING RATE AT 1000 PSI

\*\*\* SAMPLE SIZE SUMMARY \*\*\*

AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES
11.0	1	40.0	11	65.0	27	90.0	36
14.0	1	41.0	4	66.0	18	91.0	24
15.0	1	42.0	9	67.0	8	92.0	9
16.0	5	43.0	4	68.0	5	93.0	17
18.0	1	44.0	7	69.0	4	94.0	15
19.0	4	45.0	4	70.0	7	95.0	19
20.0	5	46.0	3	71.0	2	96.0	12
21.0	4	47.0	7	72.0	6	97.0	17
22.0	4	48.0	1	73.0	2	98.0	15
24.0	10	49.0	9	74.0	1	100.0	3
25.0	13	50.0	4	75.0	30	101.0	9
26.0	12	51.0	14	76.0	26	102.0	6
27.0	18	52.0	18	77.0	22	103.0	6
28.0	18	53.0	35	78.0	13	105.0	9
29.0	25	54.0	31	79.0	7	106.0	6
30.0	12	55.0	25	80.0	21	108.0	3
31.0	33	56.0	18	81.0	24	113.0	3
32.0	39	57.0	19	82.0	7	115.0	36
33.0	51	58.0	16	83.0	9	116.0	42
34.0	33	59.0	24	84.0	9	117.0	3
35.0	41	60.0	13	85.0	3	118.0	3
36.0	33	61.0	10	86.0	3	120.0	39
37.0	10	62.0	17	87.0	3	121.0	12
38.0	2	63.0	20	88.0	12	129.0	3
39.0	4	64.0	40	89.0	24	130.0	12
						131.0	6
						135.0	23
						136.0	3
						139.0	12
						140.0	12

MAXIMUM PRESSURE

STAGE 1 WING 6 TP-H 1011

This sample size summary is applicable to figures 61 and 62

$Y = (1 + 3.6218114E+03) + (-4.1259166E-01) \times X$   
 $F = +2.3979397E+01$  SIGNIFICANCE OF F = SIGNIFICANT  
 $R = -1.2759122E-01$  SIGNIFICANCE OF R = SIGNIFICANT  
 $t = +4.8968763E+00$  SIGNIFICANCE OF t = SIGNIFICANT  
 $N = 1451$  DEGREES OF FREEDOM = 1449  
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = 500 PSI INT PRES

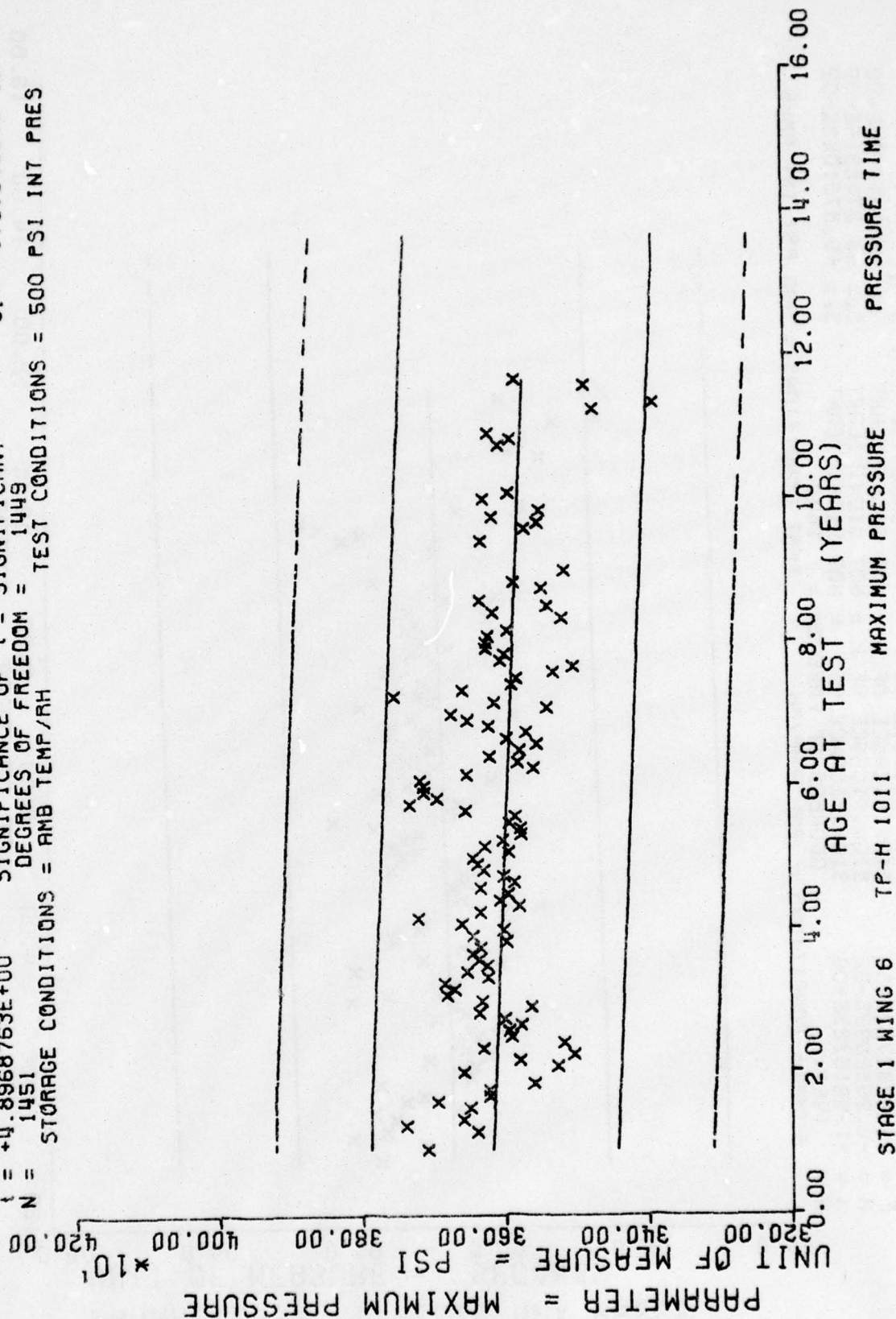


Figure 61

$Y = ((+6.8143686E-01) + (-9.9780419E-05) * X)$   
 $F = +3.5782729E+00$  SIGNIFICANCE OF F = NOT SIGNIFICANT  $G = +6.3817705E-02$   
 $R = -4.9632592E-02$  SIGNIFICANCE OF R = NOT SIGNIFICANT  $S = +5.2748315E-05$   
 $t = +1.8916323E+00$  SIGNIFICANCE OF t = NOT SIGNIFICANT  $S_z = +6.3761043E-02$   
 $N = 1451$  DEGREES OF FREEDOM = 1449  
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = 500 PSI INT PRES

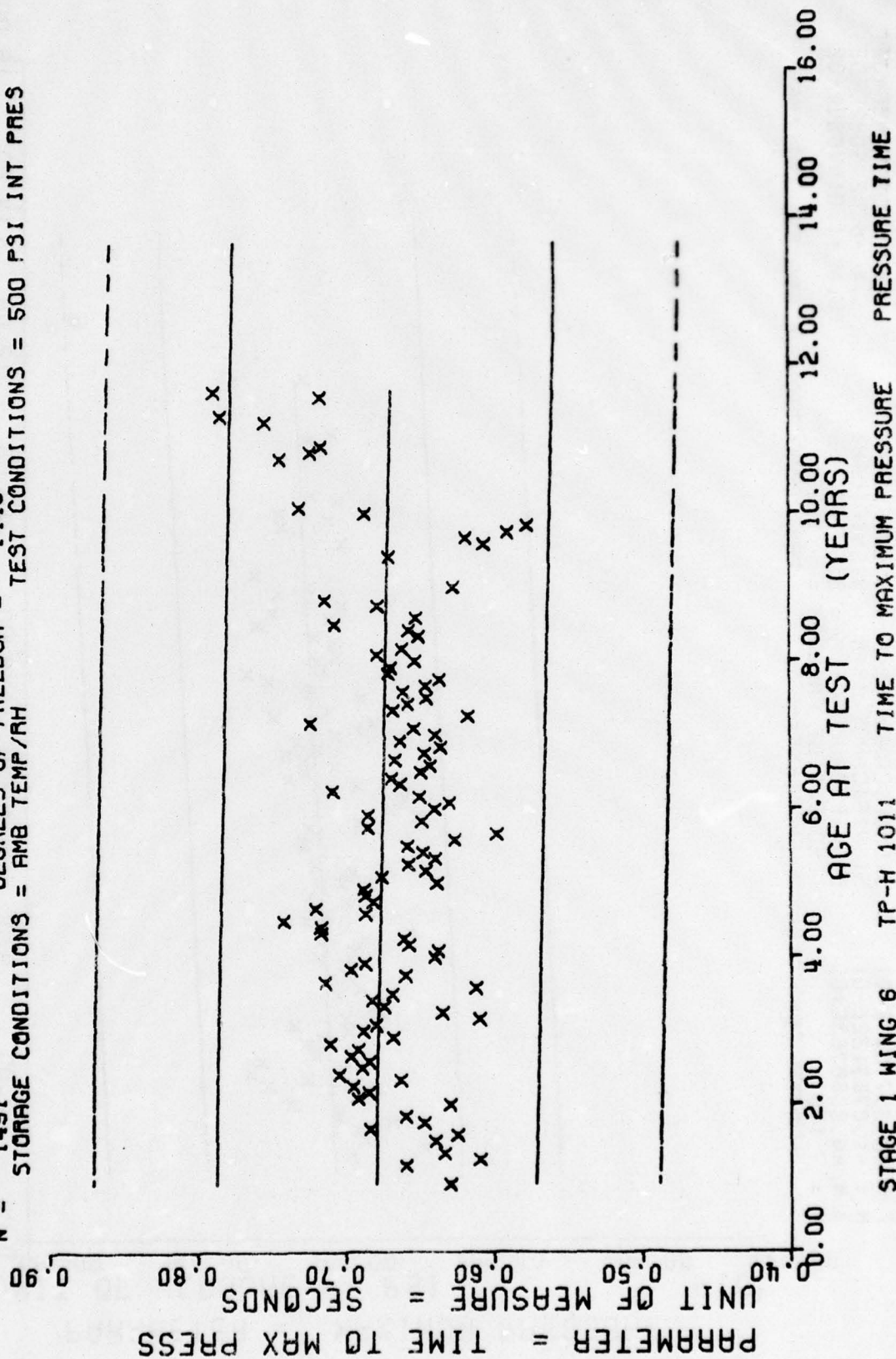


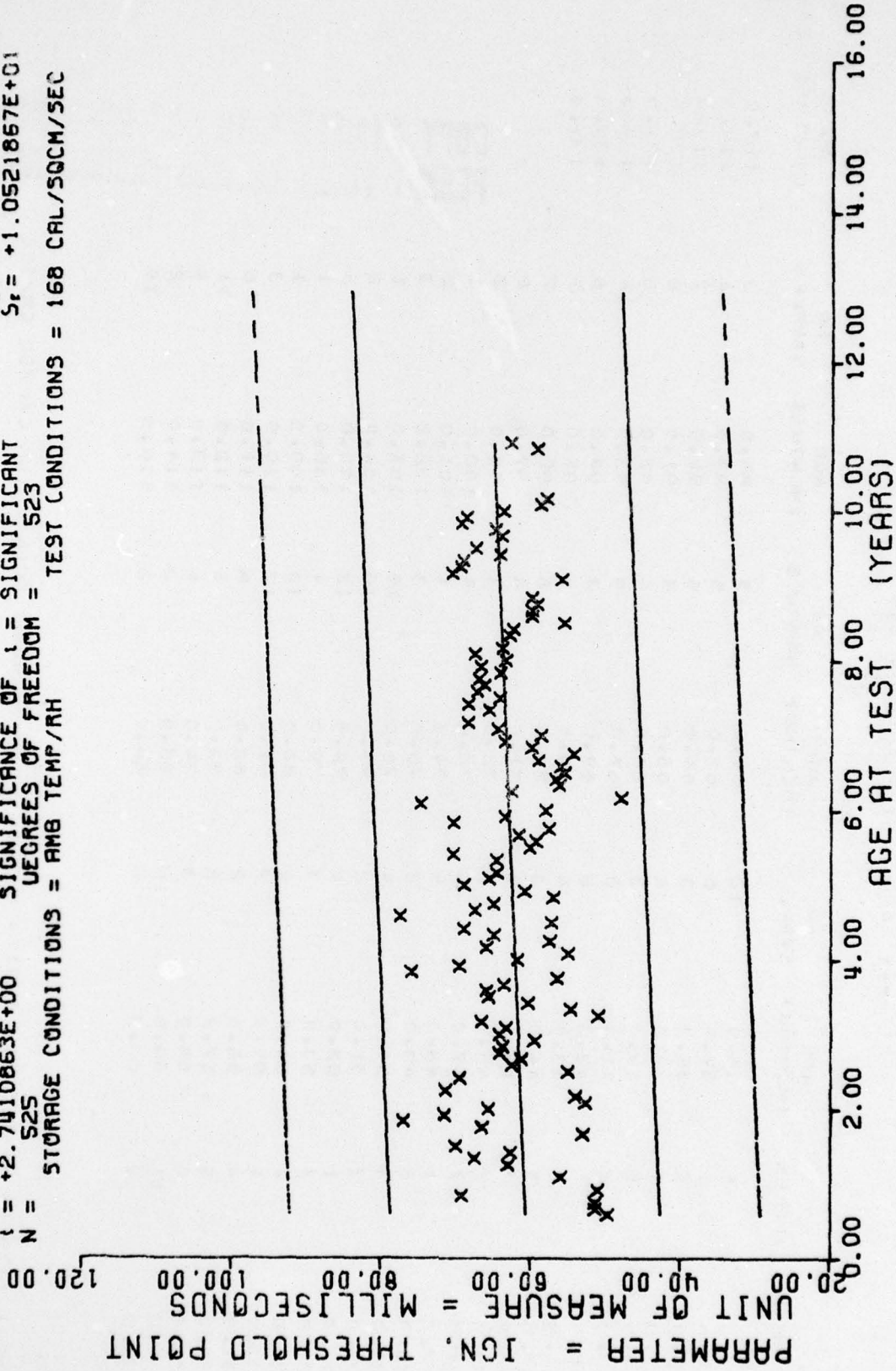
Figure 62

COPY AVAILABLE TO DOD DOES NOT  
PERMIT FULLY LEGIBLE PRODUCTION

STAGE 1 WING 6, TP-H 1011, IGNITABILITY, IGN THRESHOLD POINT, 168 CAL/SQ CM/SEC

- 93 -

$Y = ((+6.0390799E+01) + (+3.6814871E-02) * X)$   
 F = +7.5135544E+00 SIGNIFICANCE OF F = SIGNIFICANT  $G_4 = +1.0587061E+01$   
 R = +1.1900754E-01 SIGNIFICANCE OF R = SIGNIFICANT  $S_4 = +1.3430759E-02$   
 t = +2.7410863E+00 SIGNIFICANCE OF t = SIGNIFICANT  $S_7 = +1.0521867E+01$   
 N = 525 DEGREES OF FREEDOM = 523  
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = 168 CAL/SQCM/SEC



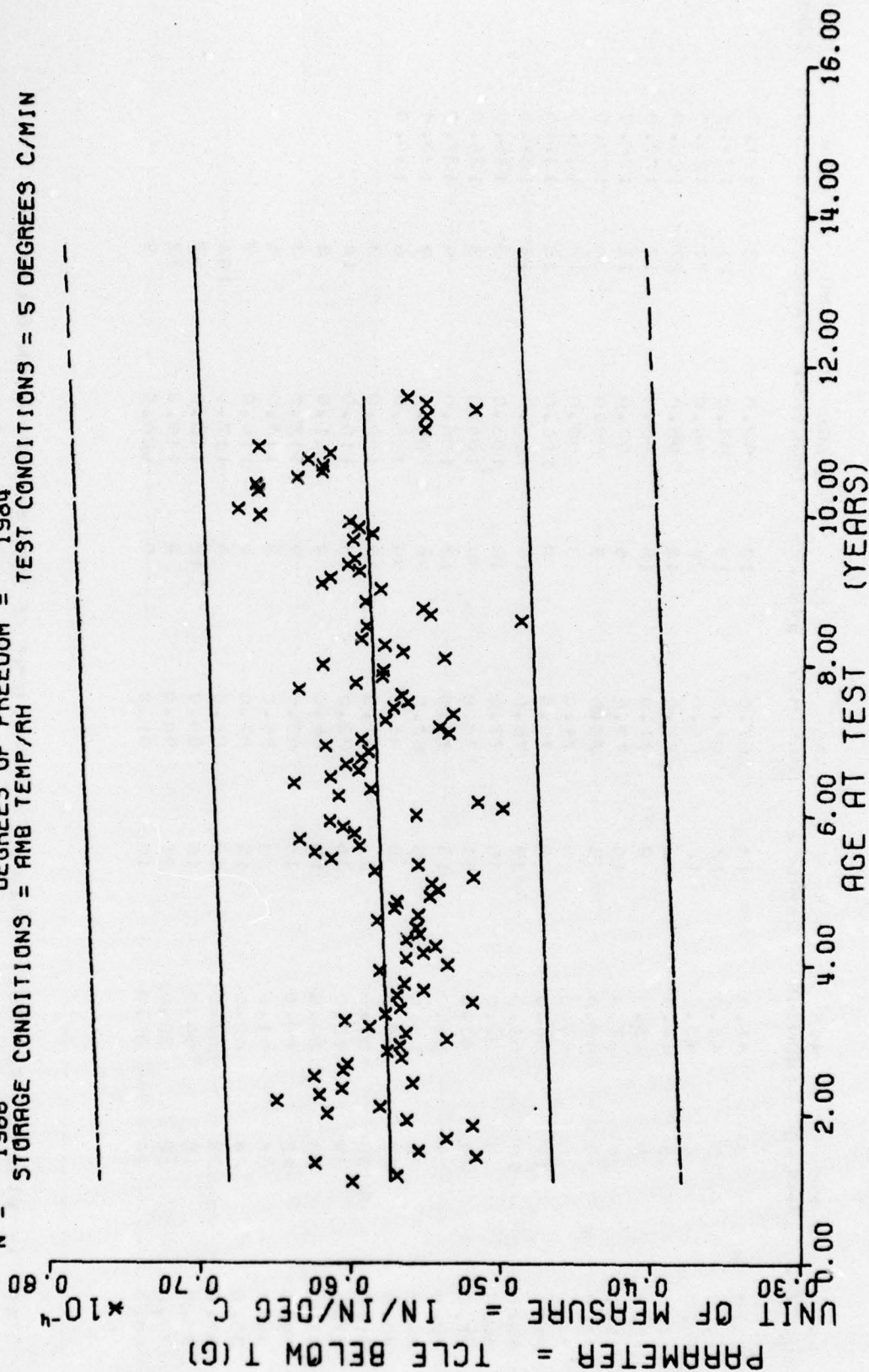
STAGE 1 WING 6. TP-H 1011, IGNITABILITY, IGN THRESHOLD POINT, 168 CAL/SQ CM/SEC

AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES
13.0	3	41.0	18	67.0	12	92.0	3	121.0	3		
14.0	3	42.0	12	68.0	18	93.0	21	124.0	21		
15.0	6	43.0	12	69.0	24	94.0	21	125.0	27		
17.0	3	44.0	6	70.0	12	95.0	27	126.0	9		
18.0	9	45.0	9	71.0	18	96.0	12	127.0	27		
20.0	6	47.0	15	72.0	6	97.0	12	128.0	18		
22.0	9	48.0	3	73.0	3	98.0	36	129.0	6		
23.0	6	49.0	6	74.0	3	99.0	12	130.0	9		
24.0	12	50.0	9	75.0	9	100.0	15	131.0	6		
25.0	18	51.0	39	76.0	19	102.0	12	134.0	24		
26.0	9	52.0	45	77.0	18	103.0	3	135.0	3		
27.0	24	53.0	51	78.0	30	104.0	3	136.0	3		
28.0	21	54.0	15	79.0	12	105.0	9	137.0	6		
29.0	24	55.0	33	80.0	24	106.0	9	138.0	57		
30.0	27	56.0	30	81.0	39	108.0	6	139.0	30		
31.0	33	57.0	27	82.0	12	109.0	3				
32.0	39	58.0	36	83.0	18	110.0	18				
33.0	33	59.0	15	84.0	9	111.0	3				
34.0	42	60.0	15	85.0	9	112.0	3				
35.0	36	61.0	9	86.0	9	113.0	6				
36.0	24	62.0	15	87.0	6	116.0	9				
37.0	38	63.0	12	88.0	3	117.0	102				
38.0	15	64.0	15	89.0	12	118.0	63				
39.0	12	65.0	21	90.0	9	119.0	12				
40.0	24	66.0	12	91.0	9	120.0	9				

TP-H1011 THERMAL COEFFICIENT OF LINEAR EXPANSION BELOW TG

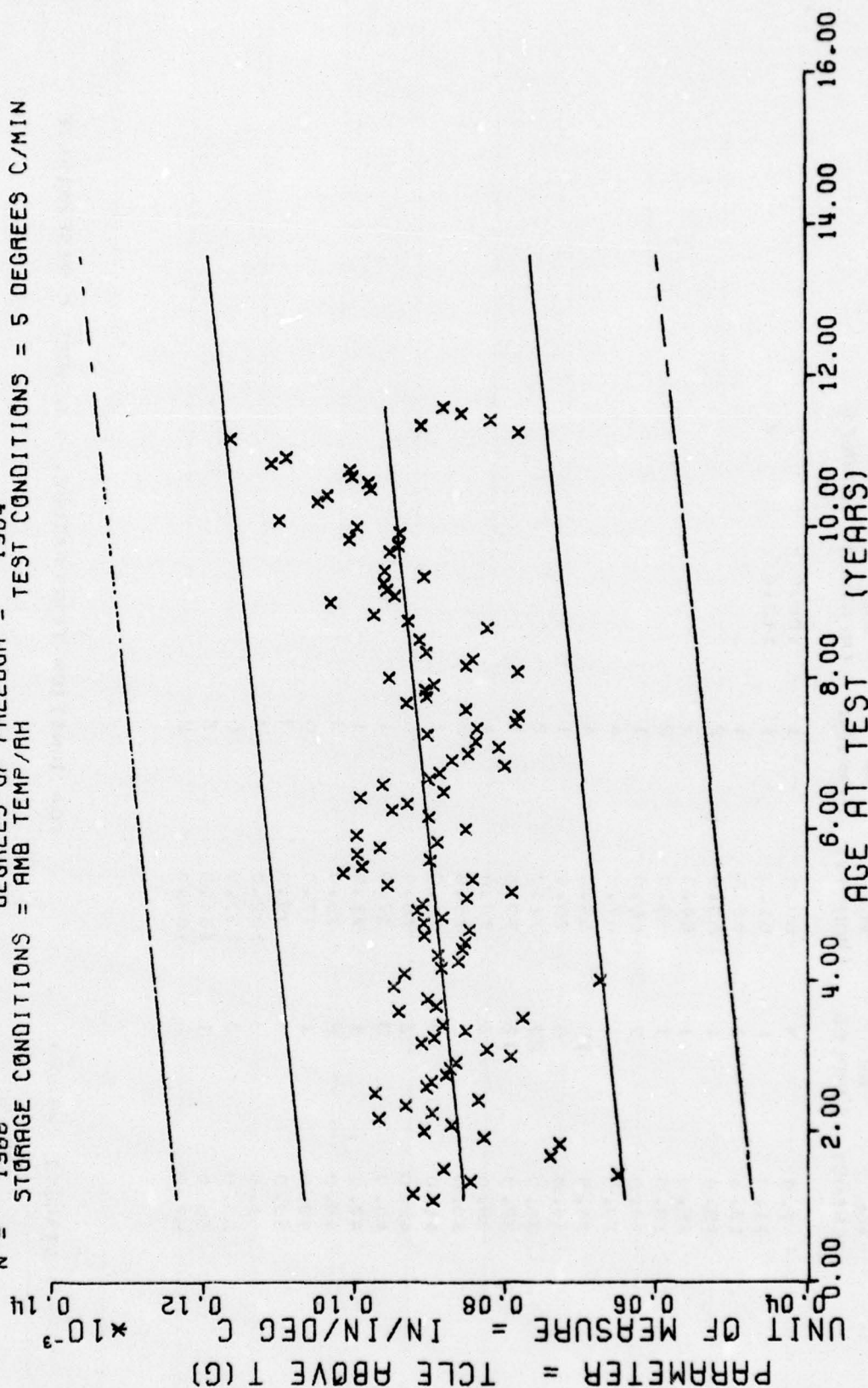
This sample size summary is applicable to fugres 64 and 65

$Y = ((+5.7154090E-05) + (+1.7462027E-08) * X)$   
 $F = +1.8244924E+01$  SIGNIFICANCE OF F = SIGNIFICANT  $\sigma = +6.5193143E-06$   
 $R = +9.5458023E-02$  SIGNIFICANCE OF R = SIGNIFICANT  $S_e = +4.0881198E-09$   
 $t = +4.2714078E+00$  SIGNIFICANCE OF t = SIGNIFICANT  $S_r = +6.4911788E-06$   
 $N = 1986$  DEGREES OF FREEDOM = 1984  
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = 5 DEGREES C/MIN



STAGE 1. WING 6. TP-H1011 THERMAL COEFFICIENT OF LINEAR EXPANSION BELOW TG

$\gamma = ((+8.4381030E-05) + (+8.2284511E-08) \times X)$   
 $F = +1.0466598E+02$  SIGNIFICANCE OF F = SIGNIFICANT  $\sigma_t = +1.3099946E-05$   
 $R = +2.2385576E-01$  SIGNIFICANCE OF R = SIGNIFICANT  $S_e = +8.0429490E-09$   
 $t = +1.0230639E+01$  SIGNIFICANCE OF t = SIGNIFICANT  $S_t = +1.2770716E-05$   
 $N = 1986$  DEGREES OF FREEDOM = 1984  
 STORAGE CONDITIONS = AMB TEMP/AH TEST CONDITIONS = 5 DEGREES C/MIN



STAGE 1, WING 6, TP-H1011, THERMAL COEFFICIENT OF LINEAR EXPANSION ABOVE TC

Figure 65

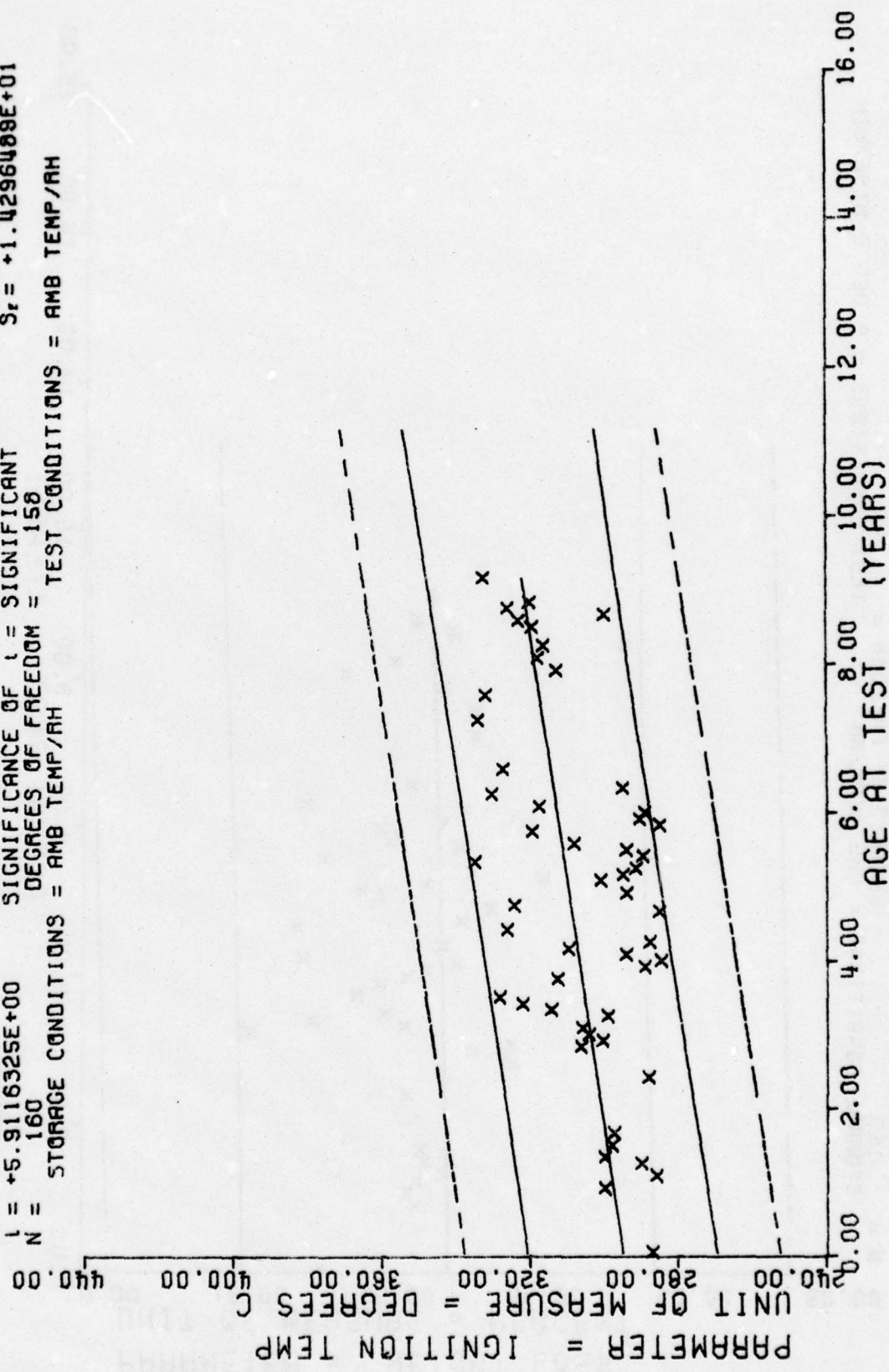
\*\*\* SAMPLE SIZE SUMMARY \*\*\*

AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES
1.0	3	59.0	1	106.0	2
11.0	1	61.0	1	110.0	2
13.0	1	62.0	1		
15.0	1	63.0	2		
16.0	1	64.0	3		
19.0	1	65.0	2		
20.0	2	66.0	1		
29.0	1	67.0	4		
34.0	10	69.0	4		
35.0	5	70.0	1		
36.0	22	71.0	2		
37.0	12	72.0	1		
39.0	3	73.0	4		
40.0	3	75.0	2		
41.0	3	76.0	1		
42.0	3	79.0	6		
45.0	3	87.0	1		
47.0	1	91.0	1		
48.0	2	95.0	3		
49.0	1	97.0	6		
50.0	3	99.0	3		
51.0	3	102.0	3		
53.0	3	103.0	6		
56.0	1	104.0	3		
57.0	3	105.0	2		

STAGE I WING 6 TGA IGNITION TEMPERATURE, 9 DEGREE C RISE/MINUTE

This sample size summary is applicable to figures 66 and 67

$Y = ((+2.9515870E+02) + (+2.4654068E-01) * X)$   
 $F = +3.4947399E+01$  SIGNIFICANCE OF F = SIGNIFICANT  
 $R = +4.2558661E-01$  SIGNIFICANCE OF R = SIGNIFICANT  
 $L = +5.9116325E+00$  SIGNIFICANCE OF L = SIGNIFICANT  
 $N = 160$  DEGREES OF FREEDOM = 158  
 STORAGE CONDITIONS = AMB TEMP/AH TEST CONDITIONS = AMB TEMP/AH



STAGE I WING 6 TGA IGNITION TEMPERATURE, 9 DEGREE C RISE/MINUTE

Figure 66

$Y = ((+2.9824441E+01) + (-9.9807626E-03) * X)$   
 $F = +2.8157809E-01$  SIGNIFICANCE OF F = NOT SIGNIFICANT  $\sigma = +6.1194281E+00$   
 $R = -4.3576850E-02$  SIGNIFICANCE OF R = NOT SIGNIFICANT  $S_e = +1.8808938E-02$   
 $t = +5.3063939E-01$  SIGNIFICANCE OF t = NOT SIGNIFICANT  $S_t = +6.1342345E+00$   
 $N = 150$  DEGREES OF FREEDOM = 148  
 STORAGE CONDITIONS = AMB TEMP/AH TEST CONDITIONS = 9 DEG C RISE/MIN

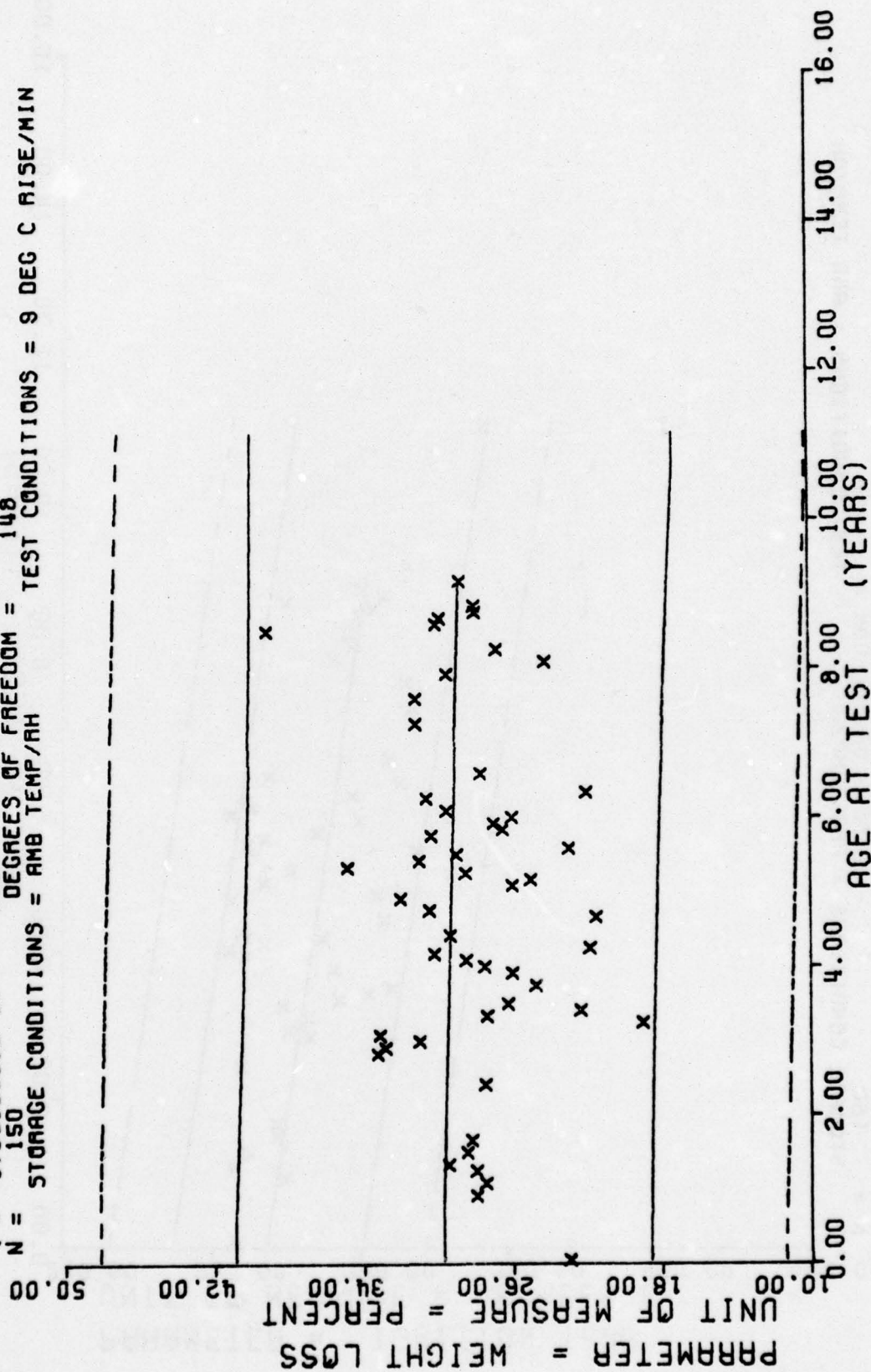


Figure 67

\*\*\* SAMPLE SIZE SUMMARY \*\*\*

AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES
34.0	4	105.0	1
36.0	6	106.0	1
37.0	1	110.0	1
39.0	1		
40.0	1		
41.0	1		
42.0	1		
43.0	1		
50.0	1		
53.0	1		
57.0	1		
64.0	1		
67.0	1		
69.0	1		
73.0	1		
75.0	1		
79.0	2		
87.0	1		
91.0	1		
95.0	1		
97.0	2		
99.0	1		
102.0	1		
103.0	2		
104.0	1		

SAGE I WING C TGA % WT LOSS AT 250 DEG C HOLD, 12 DEG RISE/MIN TO HOLD

This sample size summary is applicable to figure 68

$Y = (( +3.3713188E+01 ) + ( -4.0556017E+02 ) / X)$   
 $F = +2.4017630E+01$  SIGNIFICANCE OF F = SIGNIFICANT  $S_1 = +5.0590574E+00$   
 $R = -6.2738973E-01$  SIGNIFICANCE OF R = SIGNIFICANT  $S_2 = +8.2754234E+01$   
 $t = +4.9007785E+00$  SIGNIFICANCE OF t = SIGNIFICANT  $S_3 = +9.9923971E+00$   
 $N = 39$  DEGREES OF FREEDOM = 37  
 STORAGE CONDITIONS = AMB TEMP/AH TEST CONDITIONS = 12 DEG R/M TOHLD

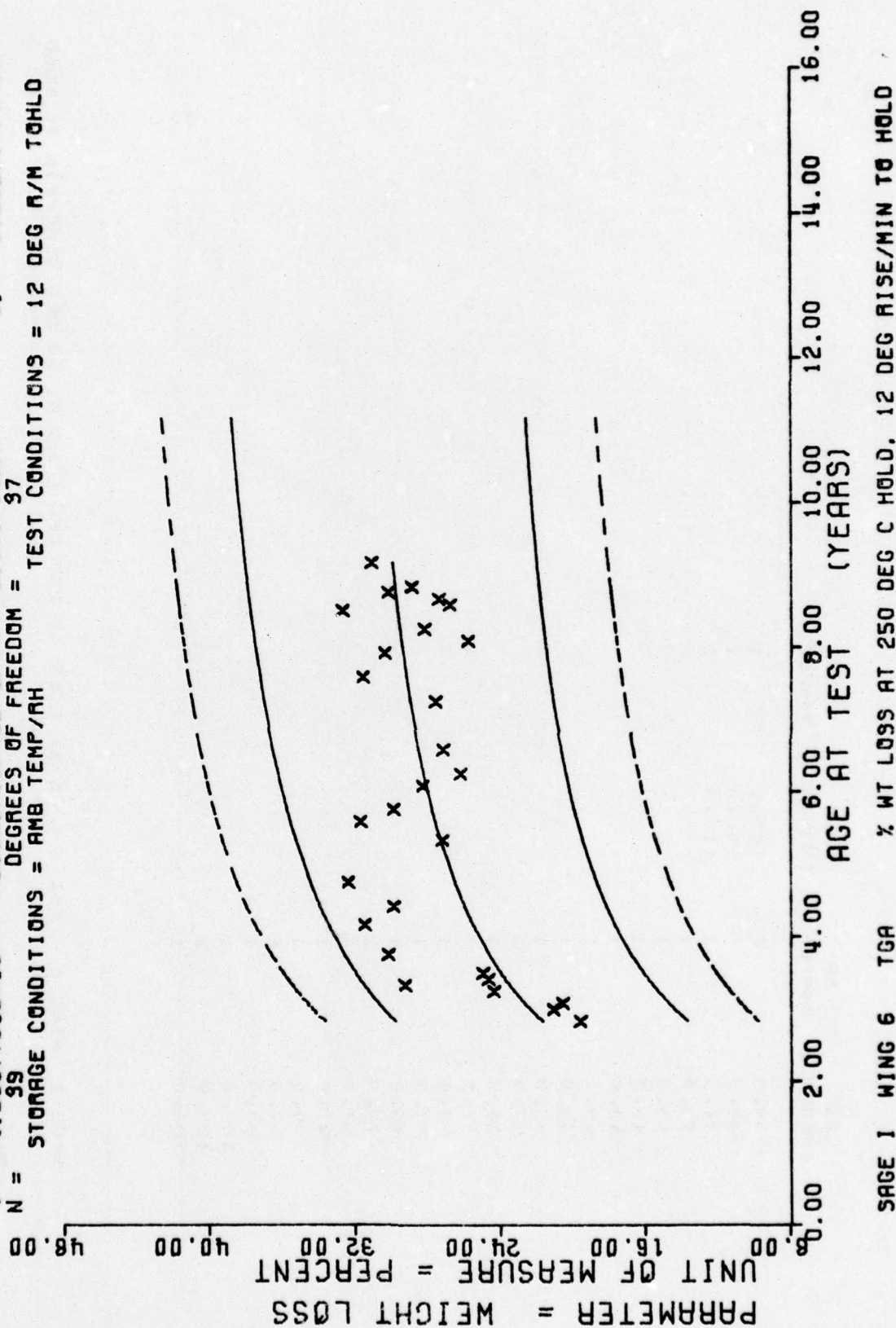
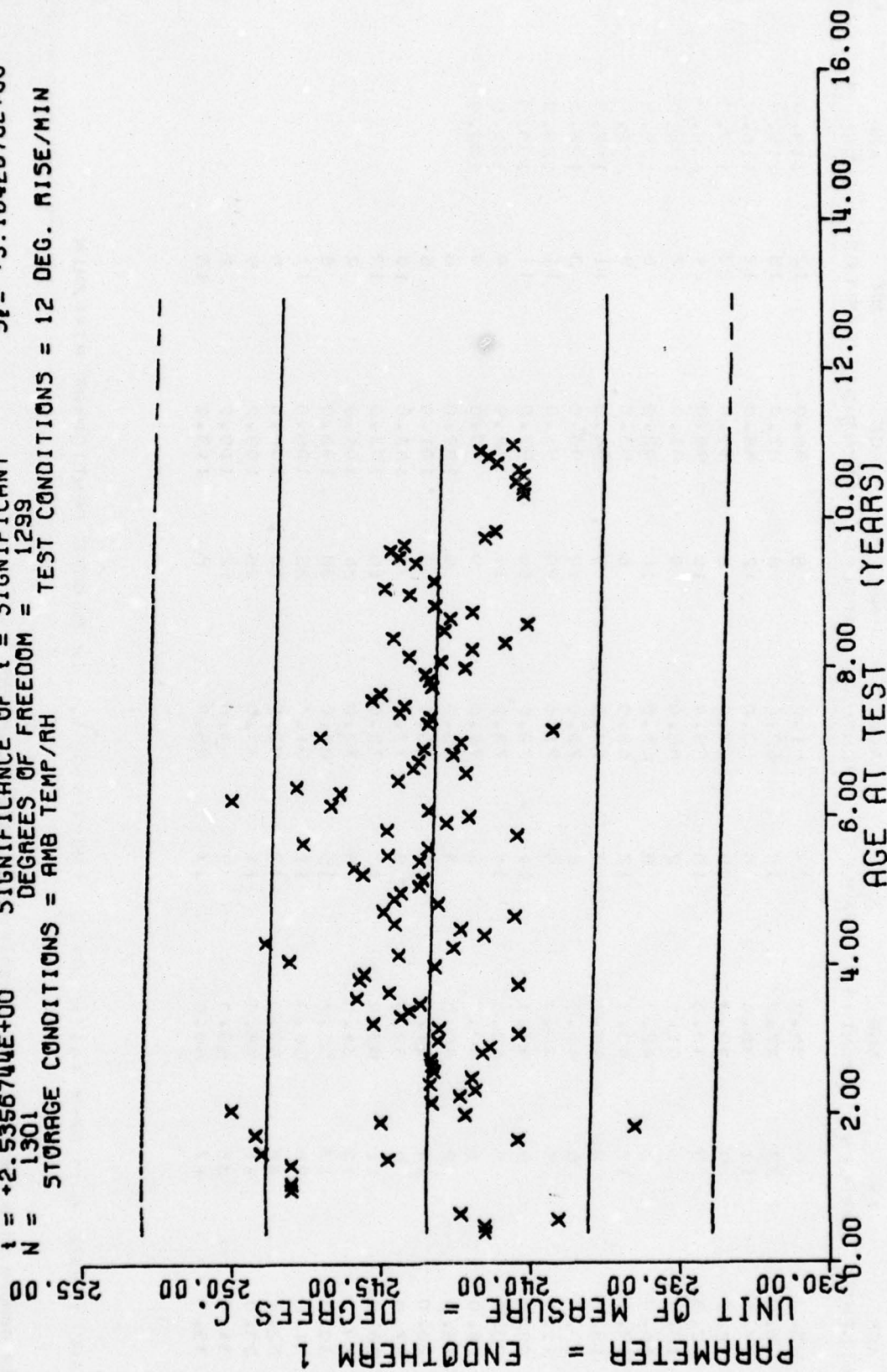


Figure 68

AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES
5.0	9	36.0	29	61.0	8	86.0	12	114.0	41		
6.0	27	37.0	18	62.0	8	87.0	15	115.0	15		
7.0	11	38.0	6	63.0	12	88.0	12	116.0	3		
8.0	9	39.0	5	64.0	5	89.0	23	117.0	13		
12.0	3	40.0	15	65.0	10	90.0	24	118.0	38		
13.0	3	41.0	2	66.0	9	91.0	7	124.0	3		
16.0	5	42.0	8	67.0	16	92.0	6	125.0	15		
17.0	12	43.0	12	68.0	6	93.0	9	126.0	15		
18.0	2	44.0	3	69.0	9	94.0	11	127.0	3		
20.0	5	45.0	6	70.0	19	95.0	3	128.0	13		
21.0	5	46.0	6	71.0	20	96.0	11	129.0	9		
22.0	6	47.0	14	72.0	16	97.0	11	130.0	6		
23.0	5	48.0	14	73.0	14	98.0	8	131.0	9		
24.0	6	49.0	5	74.0	9	99.0	9	132.0	6		
25.0	2	50.0	3	75.0	9	100.0	6				
26.0	14	51.0	2	76.0	8	101.0	5				
27.0	9	52.0	5	77.0	7	102.0	10				
28.0	11	53.0	13	78.0	16	103.0	12				
29.0	12	54.0	8	79.0	24	104.0	2				
30.0	13	55.0	15	80.0	30	105.0	8				
31.0	20	56.0	11	81.0	23	106.0	11				
32.0	18	57.0	12	82.0	18	108.0	6				
33.0	11	58.0	14	83.0	26	109.0	9				
34.0	33	59.0	9	84.0	12	110.0	2				
35.0	17	60.0	17	85.0	8	113.0	18				

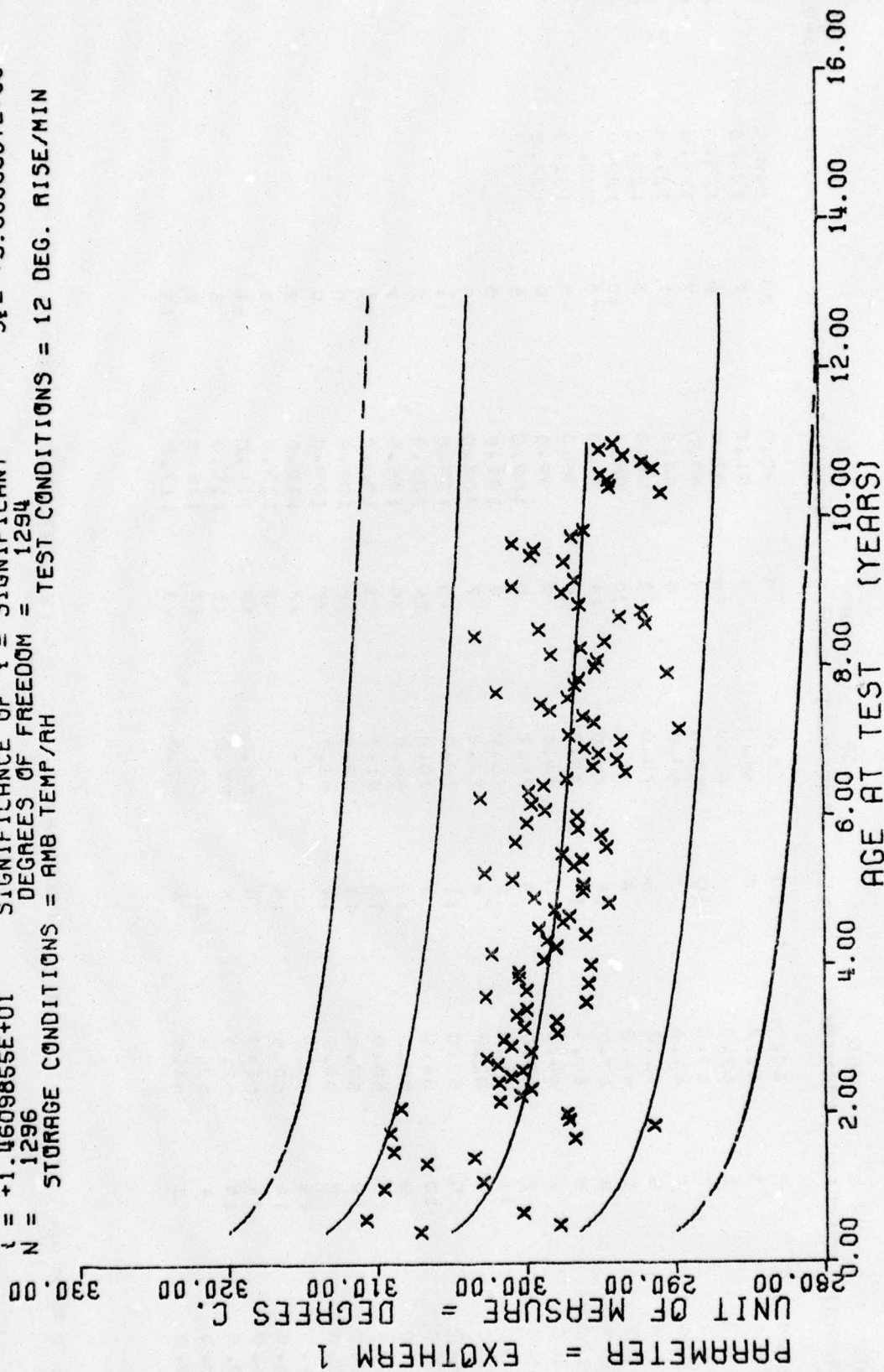
This sample size summary is applicable to figures 69 and 70

$\gamma = ((+2.4355655E+02) + (-6.6741435E-03) * X)$   
 F = +6.4296451E+00 SIGNIFICANCE OF F = SIGNIFICANT  $\alpha_1 = +3.1909099E+00$   
 R = -7.0180549E-02 SIGNIFICANCE OF R = SIGNIFICANT  $S_1 = +2.6320979E-03$   
 t = +2.5356744E+00 SIGNIFICANCE OF t = SIGNIFICANT  $S_2 = +3.1842670E+00$   
 N = 1301 DEGREES OF FREEDOM = 1299  
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = 12 DEG. RISE/MIN



STAGE 1 WING 6. TP-H 1011, DTA. ENDOTHERM 1, 12 DEGREE CENTIGRADE RISE/MIN

$\gamma = ((+3.0981894E+02) + (-6.7575434E+00) * LOG(X))$   
 $F = +2.1344787E+02$  SIGNIFICANCE OF F = SIGNIFICANT  
 $R = -3.7629180E-01$  SIGNIFICANCE OF R = SIGNIFICANT  
 $t = +1.4609855E+01$  SIGNIFICANCE OF t = SIGNIFICANT  
 $N = 1296$  DEGREES OF FREEDOM = 1294  
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = 12 DEG. RISE/MIN



STAGE 1 WING 6, TP-H 1011, DIA, EXOTHERM 1, 12 DEGREE CENTIGRADE RISE/MIN

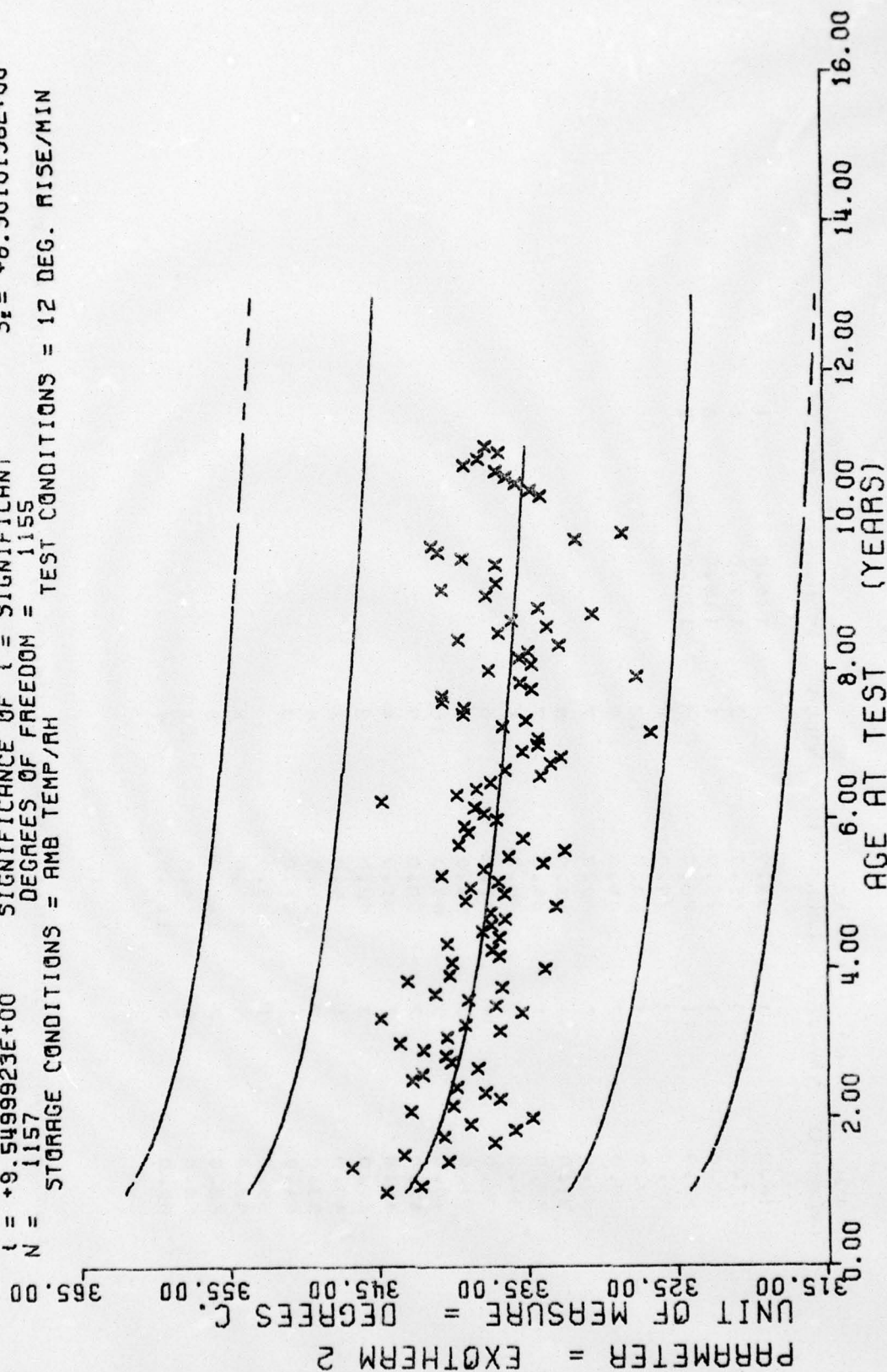
\*\*\* SAMPLE SIZE SUMMARY \*\*\*

AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES
12.0	3	40.0	13	65.0	9	90.0	23	118.0	38		
13.0	3	41.0	2	66.0	9	91.0	7	124.0	3		
15.0	5	42.0	8	67.0	16	92.0	6	125.0	15		
17.0	12	43.0	10	68.0	6	93.0	9	126.0	14		
18.0	2	44.0	3	69.0	9	94.0	11	127.0	3		
20.0	5	45.0	6	70.0	12	95.0	3	128.0	11		
21.0	5	46.0	6	71.0	20	96.0	10	129.0	8		
22.0	6	47.0	14	72.0	14	97.0	10	130.0	6		
23.0	5	48.0	14	73.0	14	98.0	8	131.0	9		
24.0	6	49.0	5	74.0	9	99.0	9	132.0	6		
25.0	2	50.0	3	75.0	9	100.0	6				
26.0	11	51.0	2	76.0	8	101.0	5				
27.0	8	52.0	4	77.0	7	102.0	10				
28.0	5	53.0	11	78.0	15	103.0	11				
29.0	10	54.0	7	79.0	24	104.0	2				
30.0	9	55.0	15	80.0	30	105.0	7				
31.0	13	56.0	10	81.0	23	106.0	11				
32.0	18	57.0	11	82.0	18	108.0	6				
33.0	7	58.0	14	83.0	22	109.0	9				
34.0	26	59.0	9	84.0	12	110.0	2				
35.0	14	60.0	15	85.0	7	113.0	18				
36.0	24	61.0	8	86.0	12	114.0	41				
37.0	14	62.0	8	87.0	15	115.0	15				
38.0	4	63.0	12	88.0	12	116.0	3				
39.0	3	64.0	4	89.0	23	117.0	13				

STAGE 1 WING 6, TP-H 1011, DIA, EXOTHERM 2, 12 DEGREE CENTIGRADE RISE/MIN

This sample size summary is applicable to figure 71

$Y = ((+3.5191242E+02) + (-8.0102328E+00) * LOG(X))$   
 $F = +9.1202353E+01$  SIGNIFICANCE OF F = SIGNIFICANT  $\sigma_1 = +6.5422296E+00$   
 $R = -2.7052583E-01$  SIGNIFICANCE OF R = SIGNIFICANT  $S_2 = +8.3876851E-01$   
 $t = +9.5499923E+00$  SIGNIFICANCE OF t = SIGNIFICANT  $S_2 = +6.9010136E+00$   
 $N = 1157$  DEGREES OF FREEDOM = 1155  
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = 12 DEG. RISE/MIN



STAGE 1 WING 6, TP-H 1011, DTA, EXOTHERM 2, 12 DEGREE CENTIGRADE RISE/MIN

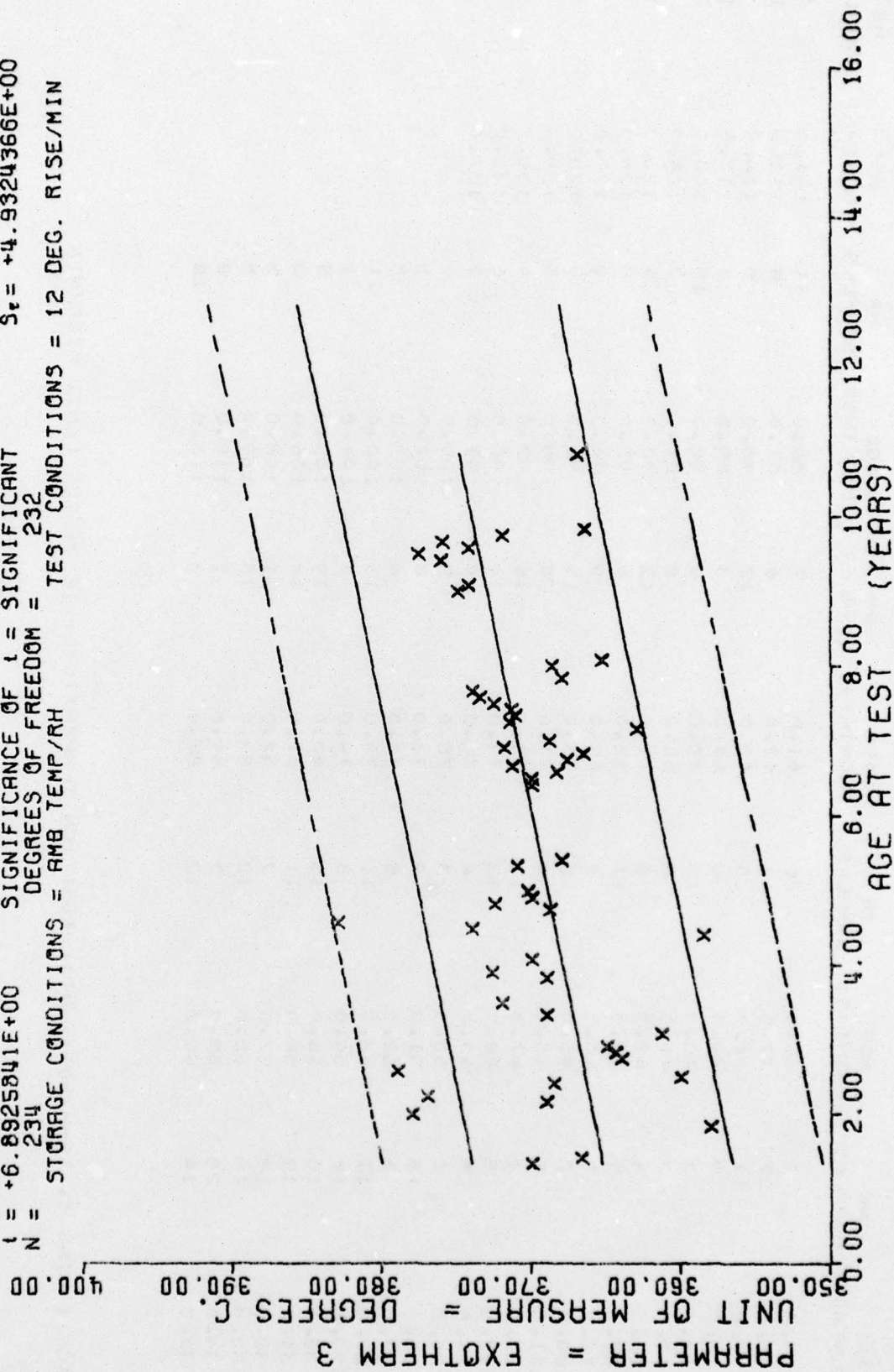
\*\*\* SAMPLE SIZE SUMMARY \*\*\*

AGE (MONTHS)	NP SAMPLES	AGE (MONTHS)	NP SAMPLES	AGE (MONTHS)	NP SAMPLES
16.0	1	64.0	2	116.0	1
17.0	3	65.0	2	117.0	1
22.0	1	77.0	1	118.0	2
24.0	1	78.0	3	130.0	2
26.0	2	79.0	18		
27.0	1	80.0	12		
29.0	2	81.0	9		
30.0	2	82.0	7		
31.0	1	83.0	8		
33.0	1	84.0	7		
34.0	5	86.0	1		
35.0	4	87.0	6		
37.0	3	88.0	8		
40.0	5	89.0	16		
42.0	3	90.0	9		
46.0	2	91.0	4		
47.0	3	92.0	2		
49.0	1	94.0	2		
53.0	2	96.0	5		
54.0	1	97.0	3		
55.0	1	108.0	3		
57.0	5	109.0	4		
58.0	2	113.0	8		
59.0	6	114.0	21		
60.0	4	115.0	4		

STAGE 1 WING C. TP-H 1011, DTA. EXOTHERM 3, 12 DEGREE CENTIGRADE PISE/MIN

This sample size summary is applicable to figure 72

$F = +4.7507716E+01$  SIGNIFICANCE OF F = (+8.4603379E-02) \* X)  
 $R = +4.1227326E-01$  SIGNIFICANT  
 $t = +6.8925841E+00$  SIGNIFICANCE OF t = SIGNIFICANT  
 $N = 234$  DEGREES OF FREEDOM = 232  
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = 12 DEG. RISE/MIN



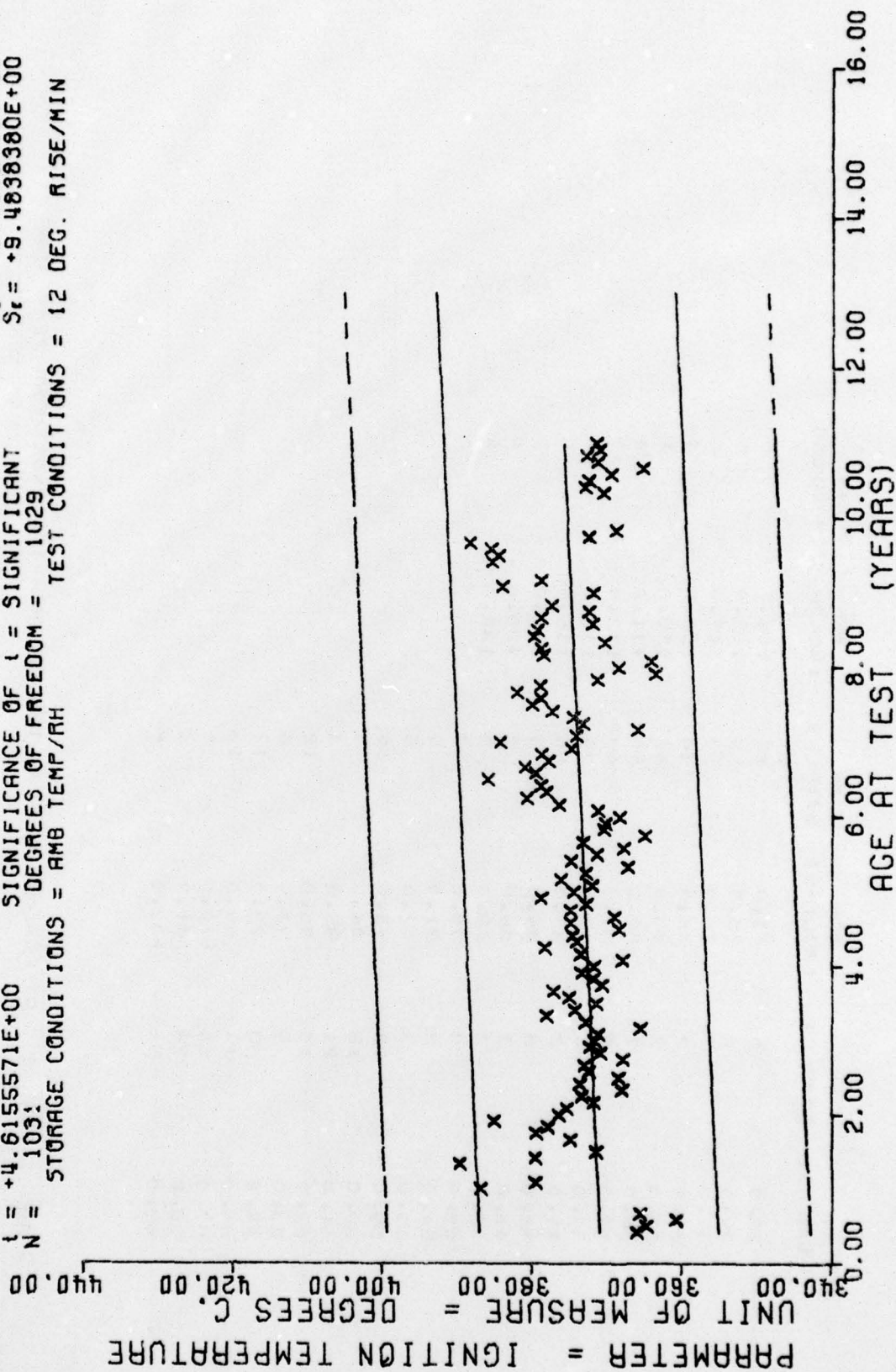
STAGE 1 WING 6, TP-H 1011, DTA, EXOTHERM 3, 12 DEGREE CENTIGRADE RISE/MIN

AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES
5.0	9	36.0	26	61.0	7	86.0	11
5.0	27	37.0	14	62.0	6	87.0	9
7.0	11	38.0	6	63.0	12	88.0	5
8.0	9	39.0	5	64.0	3	89.0	7
12.0	3	40.0	10	65.0	8	90.0	15
13.0	3	41.0	2	66.0	8	91.0	3
16.0	4	42.0	5	67.0	13	92.0	4
17.0	9	43.0	11	68.0	6	93.0	9
18.0	2	44.0	3	69.0	9	94.0	9
20.0	2	45.0	5	70.0	19	95.0	3
21.0	5	46.0	4	71.0	20	96.0	5
22.0	2	47.0	11	72.0	16	97.0	4
23.0	5	48.0	13	73.0	14	98.0	6
24.0	5	49.0	4	74.0	9	99.0	3
25.0	2	50.0	3	75.0	9	100.0	6
26.0	12	51.0	2	76.0	8	101.0	5
27.0	8	52.0	5	77.0	6	102.0	8
28.0	11	53.0	11	78.0	13	103.0	11
29.0	10	54.0	8	79.0	7	104.0	1
30.0	10	55.0	15	80.0	19	105.0	5
31.0	19	56.0	11	81.0	14	106.0	8
32.0	18	57.0	7	82.0	11	108.0	3
33.0	10	58.0	12	83.0	18	109.0	5
34.0	28	59.0	3	84.0	7	110.0	2
35.0	14	60.0	12	85.0	8	113.0	10

STAGE 1 WING 6. TP-H 1011. DTA. IGNITION TEMPERATURE. 12 DEGREE CENT. PISE/MIN

This sample size summary is applicable to figure 73

$Y = [(+3.7092165E+02) + (+3.9376430E-02) * X]$   
 $F = +2.1303368E+01$  SIGNIFICANCE OF F = SIGNIFICANT  $\alpha_1 = +9.5768546E+00$   
 $R = +1.4241861E-01$  SIGNIFICANCE OF R = SIGNIFICANT  $S_e = +8.5312408E-03$   
 $t = +4.6155571E+00$  SIGNIFICANCE OF t = SIGNIFICANT  $S_t = +9.4838380E+00$   
 $N = 103$  DEGREES OF FREEDOM = 1029  
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = 12 DEG. RISE/MIN

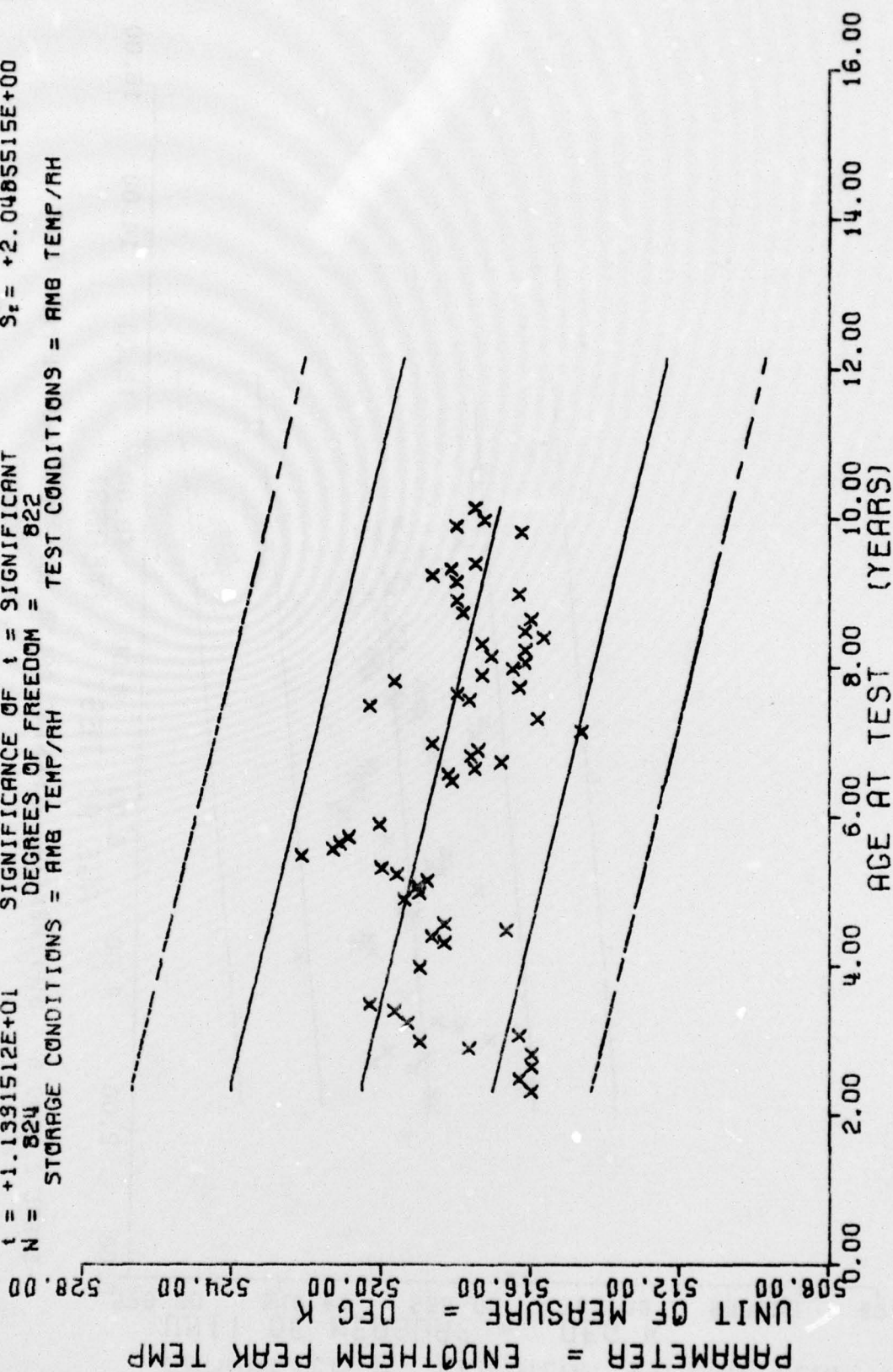


STAGE 1 WING 6, TP-H 1011, OTA, IGNITION TEMPERATURE, 12 DEGREE CENT. RISE/MIN

\*\*\* SAMPLE SIZE SUMMARY \*\*\*

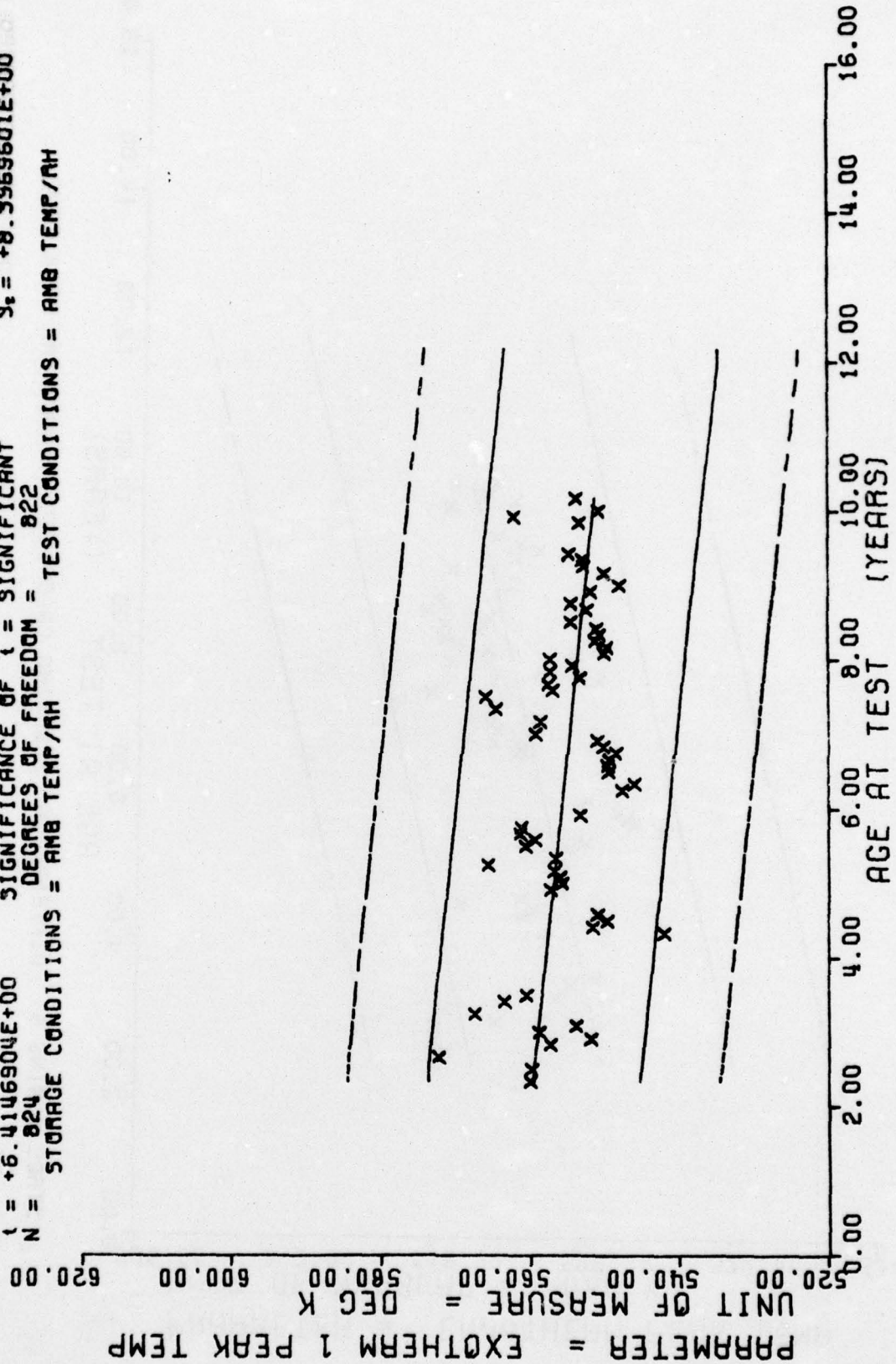
AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES
29.0	6	71.0	15	104.0	3
30.0	3	75.0	3	105.0	6
32.0	2	76.0	3	107.0	6
34.0	2	78.0	30	108.0	3
35.0	3	79.0	42	110.0	1
36.0	7	80.0	56	111.0	34
37.0	3	81.0	42	112.0	13
39.0	6	82.0	32	113.0	4
41.0	2	83.0	50	118.0	40
42.0	3	84.0	3	119.0	22
43.0	3	86.0	3	120.0	4
52.0	3	88.0	6	122.0	4
53.0	3	90.0	3		
54.0	3	91.0	9		
55.0	3	92.0	5		
59.0	10	93.0	6		
60.0	18	94.0	3		
61.0	21	95.0	3		
62.0	15	96.0	12		
63.0	5	97.0	0		
64.0	3	98.0	12		
66.0	14	99.0	18		
67.0	54	100.0	6		
68.0	78	101.0	3		
69.0	36	102.0	6		

$F = +1.2840318E+02$  SIGNIFICANCE OF F = SIGNIFICANT  $\sigma_t = +2.2014099E+00$   
 $R = -3.6756483E-01$  SIGNIFICANCE OF R = SIGNIFICANT  $S_e = +3.5216391E-03$   
 $t = +1.1391512E+01$  SIGNIFICANCE OF t = SIGNIFICANT  $S_t = +2.0485515E+00$   
 $N = 824$  DEGREES OF FREEDOM = 822  
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = AMB TEMP/RH



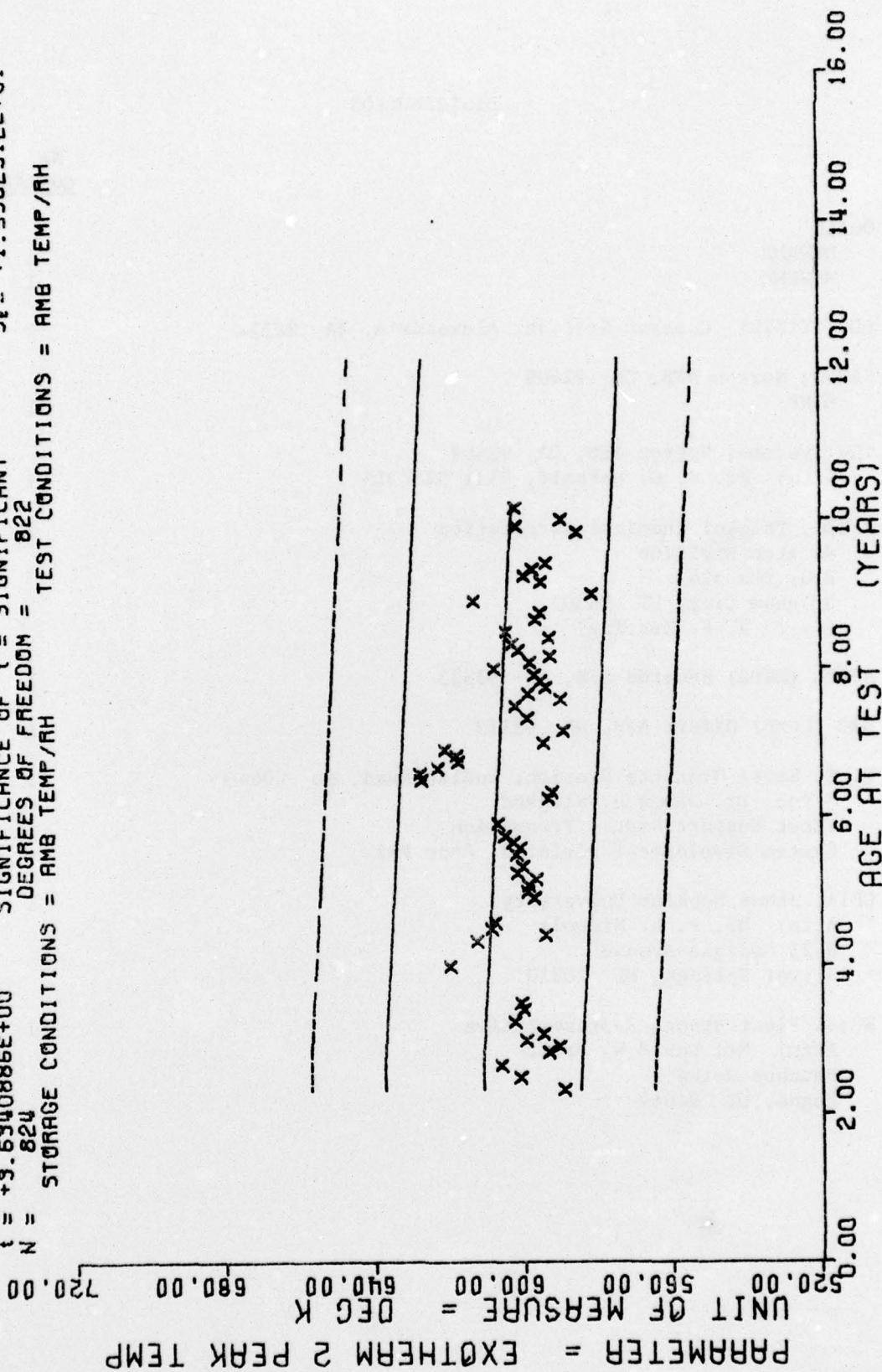
STAGE I WING 6 DIFFERENTIAL SCANNING CALORIMETER ENDOTHERM PEAK TEMP

$Y = [(+5.6293259E+02) + (-9.1935108E-02) \times X]$   
 $F = +4.1148254E+01$  SIGNIFICANCE OF F = SIGNIFICANT  $\alpha = +8.5378890E+00$   
 $R = -2.1893985E-01$  SIGNIFICANCE OF R = SIGNIFICANT  $\beta_0 = +1.4331963E-02$   
 $t = +6.4146904E+00$  SIGNIFICANCE OF t = SIGNIFICANT  $\beta_1 = +8.3969501E+00$   
 $N = 824$  DEGREES OF FREEDOM = 822  
 STORAGE CONDITIONS = AMB TEMP/AM TEST CONDITIONS = AMB TEMP/AM



STAGE I WING 6 DIFFERENTIAL SCANNING CALORIMETER EXOTHERM 1 PEAK TEMP

$Y = ((+6.1430108E+02) + (-9.5974470E-02) \times X)$   
 $F = +1.3206600E+01$  SIGNIFICANCE OF F = SIGNIFICANT  
 $R = -1.2574726E-01$  SIGNIFICANCE OF R = SIGNIFICANT  
 $t = +9.6340886E+00$  SIGNIFICANCE OF t = SIGNIFICANT  
 $N = 824$  DEGREES OF FREEDOM = 822  
 STORAGE CONDITIONS = AMB TEMP/AH TEST CONDITIONS = AMB TEMP/AH

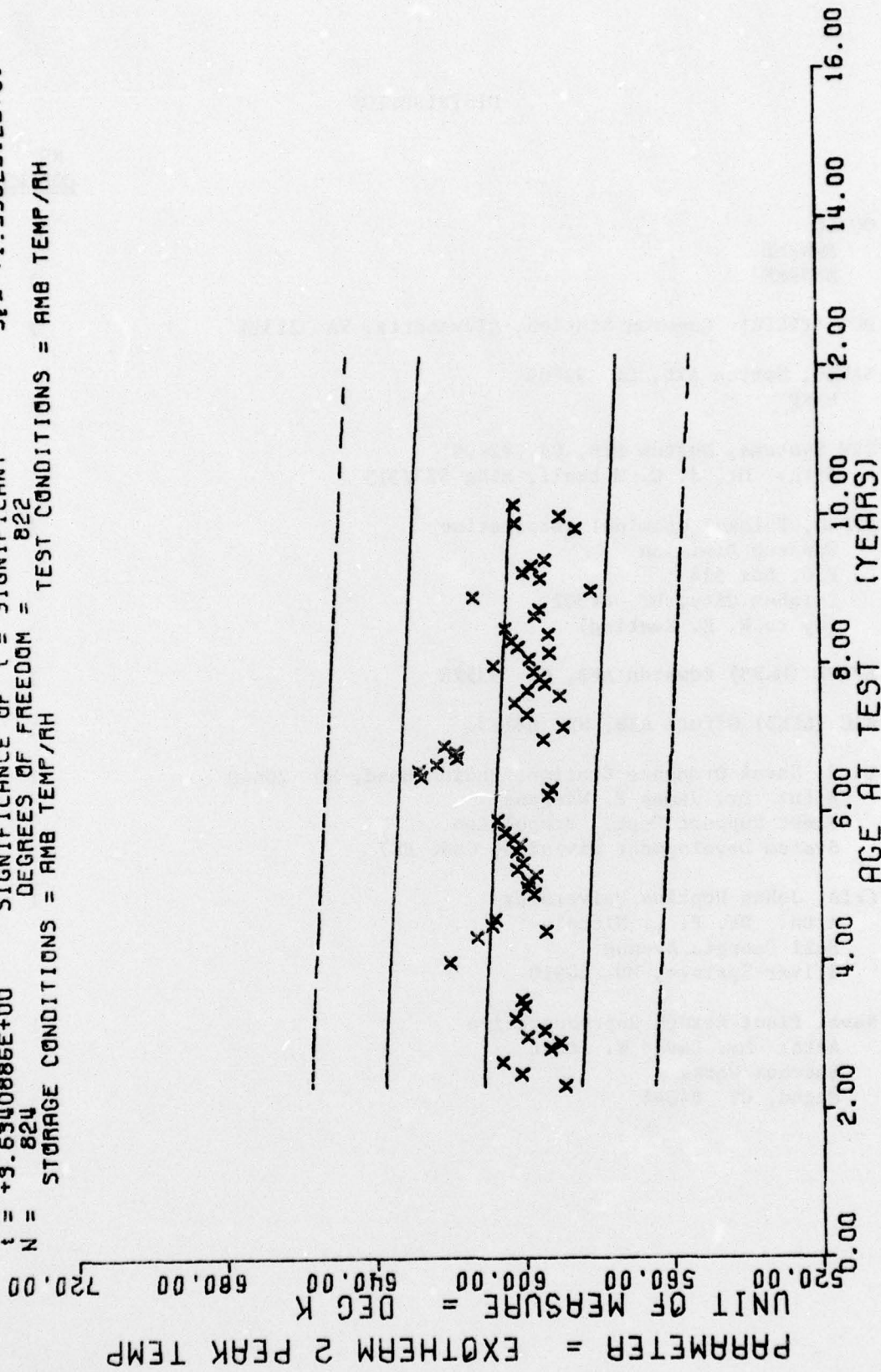


STAGE I WING 6 DIFFERENTIAL SCANNING CALORIMETER EXOTHERM 2 PEAK TEMP

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Attn: Dr. P. L. Nichols	
8621 Georgia Avenue	
Silver Springs, MD 20910	
Naval Plant Branch Representative	1
Attn: Mr. David W. Pratt	
Bacchus Works	
Magna, UT 84044	

$Y = ((+6.1490108E+02) + (-9.5974470E-02) * X)$   
 SIGNIFICANCE OF F = SIGNIFICANT  
 SIGNIFICANCE OF R = SIGNIFICANT  
 SIGNIFICANCE OF t = SIGNIFICANT  
 DEGREES OF FREEDOM = 822  
 STORAGE CONDITIONS = AMB TEMP/RH  
 TEST CONDITIONS = AMB TEMP/RH



STAGE I WING 6 DIFFERENTIAL SCANNING CALORIMETER EXOTHERM 2 PEAK TEMP

Figure 76

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4. TITLE (and Subtitle) <i>6</i> Propellant Surveillance Report LGM-30 F & G Stage 1, Phase E, Series III, TP-H1011.	5. TYPE OF REPORT & PERIOD COVERED Test Results <i>Semi-annual rept.</i>	
7. AUTHOR(s) <i>10</i> John A. Thompson	6. PERFORMING ORG. REPORT NUMBER	
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19. KEY WORDS (Continue on reverse side if necessary and identify by block number)  Solid Propellant Minuteman		
20. ABSTRACT (Continue on reverse side if necessary and identify by block number)  This report contains propellant test results from cartons of TP-H1011 bulk propellant representing LGM-30 F & G First Stage Minuteman Motors. This report uses a statistical approach to analyze the bulk carton propellant data. Testing was accomplished in accordance with MMEMP Project M72632-5MP116P.  The data from this test period are combined with data from previous		

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testing and entered into the G085 computer for storage, analysis and regression analysis. From the statistical analysis of all data tested to date (twelve years for F & G), significant degradation of the propellant does not appear likely for at least two years past the oldest data point.

Each point on the regression plot represents the mean of all samples at that particular age. The number of samples at each point is indicated on the sample size summary sheet on the page accompanying each regression plot or group of regression plots. The data range at any age can be found by suitable inquiry of the G085 system.